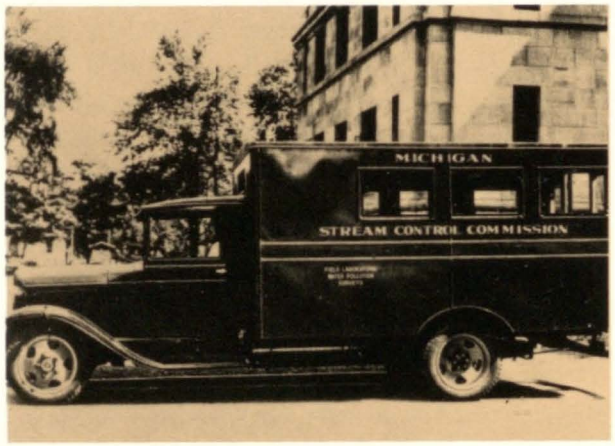
FOR REFERENCE ONLY

INDIANA COLLECTION
LAKES

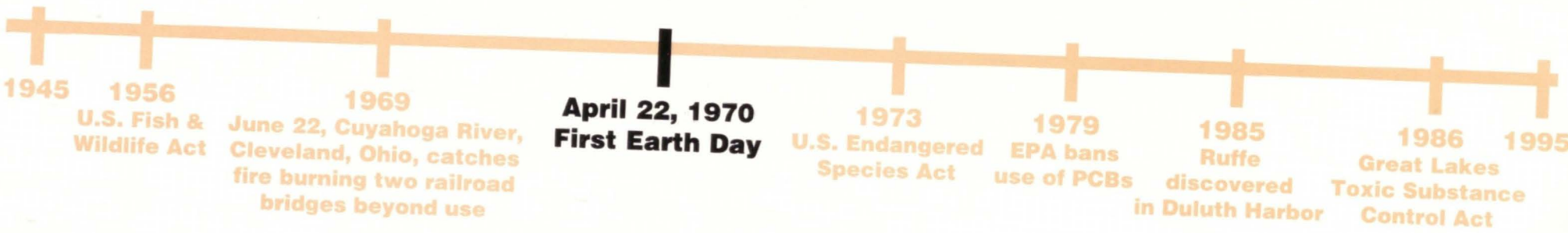
State of the Great Lakes



1994 annual report

Great Lakes Time Lines

The State of the Great Lakes, 1994 Annual Report, is the result of the sum total of all events and influences that have occurred in the Great Lakes Basin throughout history. The Great Lakes compose an interconnected and ever-changing ecosystem. Any alteration of one Lake in some way affects all of the Great Lakes. The time lines serve as visual accounts of some of the historic events that have been significant in the evolution of the Great Lakes ecosystem as it exists today.



Great Lakes — Great People

This year's annual report, on the state of the Great Lakes in 1994, is as diverse and wide-ranging as the subject itself. Whether the topic is chlorine or polluted runoff, Grand Traverse Bay or Lake Erie, the Rouge River or pollution prevention, everything comes back to the Great Lakes and the great people of Michigan who make these shores home and enjoy the bounty of these remarkable resources.

Due to the immensity of the lakes and the diversity of its people, we find ourselves focusing on particular problems, in particular places, in unique and unprecedented ways. How we deal with air deposition of toxic pollution coming from beyond our borders will be entirely different from our efforts to grapple with nutrient management and sediment control in the Saginaw Bay watershed. The problems of Lake St. Clair and Lake Erie, while similar in some ways, require differing approaches for differing priorities.

In the past, when we have identified problems with water quality, we have looked mainly to the water itself. What we are finding, through efforts such as the Saginaw Bay National Watershed Initiative, is that what happens on the land in our local communities plays a dramatic role in the quality of our inland lakes, our rivers, and eventually the Great Lakes.

In many areas of the state, including Grand Traverse Bay, and the Rouge River and Clinton River areas, local groups are forming partnerships with state and federal agencies to work toward environmental quality improvement. These partnerships are moving away from an exclusively regulatory emphasis, to a more voluntary, cooperative effort on the part of governmental agencies, businesses and local groups. These partnerships will make the necessary strides to protect the rivers and lakes that provide us with the high quality of life we enjoy.

Watersheds are the critical element in protecting the open waters of the Great Lakes as well as their tributaries. Watersheds provide the venue for community education and ultimately, action. They offer the best method of integrating the scientific, social and economic demands of the people who live in them. Ecology, hydrology, economics and, yes, politics all come together in the watershed approach to managing our natural resources, be they on the land or in the water. This theme is carried over from our 1993 report to this year's report without a ripple. It is the point of convergence of most public policy initiatives relating to our Great Lakes Basin.

Pollution prevention is another theme restated in our assessment of the state of the lakes for 1994. I was particularly honored to announce the start of the Great Printers Project — a vehicle for involving the lithographic printing industry in our ongoing efforts to make pollution prevention the cornerstone of an innovative environmental policy for the 21st century.

The principle of prevention also applies to my work as Chairman of the National Forum on Nonpoint Source Pollution which is cosponsored by the National Geographic Society and The Conservation Fund. The National Forum is a blue-ribbon group of leaders from the public, private and non-profit sectors seeking to identify and implement innovative, non-regulatory ways to reduce polluted runoff from our farms, front lawns, golf courses, livestock operations and any other activity on the land which affects water quality. 1994 saw the conclusion of the efforts of separate work groups in the areas of economic incentives, voluntary initiatives and education. In 1995, I look forward

to leading Michigan and the Council of Great Lakes Governors in the implementation of the Forum's exciting recommendations.

There are also ongoing challenges to the integrity of the Great Lakes ecosystem which continue to require our best efforts and our best thinking. Mercury, a most perplexing pollutant, is the subject of action on many fronts. The ongoing affliction of exotic nuisance species still cries out for federal leadership. The continued diversion of water from the basin also remains on our list of top priorities.

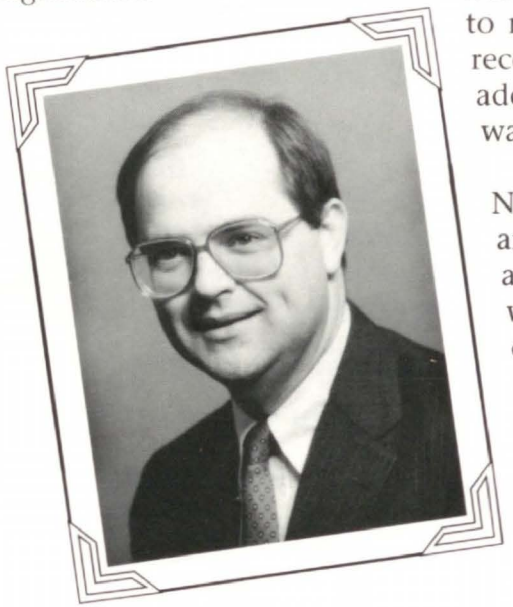
These and many other matters are addressed in this report. I hope all Michigan citizens will find this report useful in learning more about the challenges to our Great Lakes and undertake the task of meeting them head-on.

John Engler
Governor
State of Michigan

On Managing a Total Ecosystem

The 1994 report on the state of the Great Lakes coincides with the 25th anniversary of Earth Day. This coincidence offers an opportunity to reflect on the health of these resources, as a total ecosystem, in light of two and a half decades of heightened environmental awareness.

Indeed, we are beginning to appreciate the full implications of managing the Great Lakes as an ecosystem, defined by the 1978 Great Lakes Water Quality Agreement as "... the interacting components of air, land, water and living organisms, including humans, within the drainage basin ..." In the past year the Great Lakes Commission introduced the Ecosystem Charter for the Great Lakes — St. Lawrence Basin. Almost contemporaneously, U.S. EPA and Environment Canada hosted the first State of the Lakes Ecosystem Conference (SOLEC). These two noteworthy, maybe historic, events represent the further maturation of ecosystem management as the preferred model of stewardship.



The Great Lakes Basin is the home to countless commissions, governments, research institutes, public interest groups, policy shops, think tanks, field stations and laboratories, devoted exclusively to the study of this or that aspect of the lakes.

But all the research, all the data, all the theories, viewed in isolation of one another, are of limited value without an integrating principle or process to direct this massive accumulation of information toward sound public policy and private action. Ecosystem management is that principle.

An integration paper, prepared for SOLEC, recounts the fragmented approach to environmental and resources issues, previously the rule, and the transition underway: "Governments have traditionally addressed human activities on a piecemeal basis, separating decision-making on environmental quality from decision-making on natural resource management or on social or economic issues. Even within the environmental field, agencies have traditionally managed air issues separately from those dealing with water, land and wildlife. An ecosystem approach to management is a holistic approach that recognizes the interconnectedness of and addresses the linkages occurring among air, water, land and living things."

An impressive study, commissioned by the National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI), assessed the condition of the Great Lakes wherein the lakewide, "big picture" observations were to be determined from the available information. The study collected information from a literature search resulting in over 1,000 citations. An expert panel of 19 scientists also provided consultation. This panel embodied over 500 years of Great Lakes research experience.

Despite the impressive amount of information on the Great Lakes, the study noted that "the task of characterizing the environmental condition of the lakes was conceptually difficult and laborious." The reason? According to the study: "In large part this was true because very little of the available literature attempts to characterize environmental conditions based on an assessment of the Great Lakes as a whole." In other words, "there was a scarcity of information defining the condition of the Great Lakes from an 'ecosystem perspective'."

So we need to reconsider both the way we study and the way we manage the Great Lakes. No longer can we treat water quality separate from air quality or activities on the land.

No longer can we focus on chemical threats to the lakes to the exclusion of biological threats in the form of exotic species.

Nor can we manage fish and game without considering the long-term fate of their habitats.

These concepts are nothing new. Again, the 1978 Great Lakes Water Quality Agreement sought "to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem." But, as T.S. Eliot said, between the idea and the reality falls — the shadow! This is an ongoing process of continuous improvement in the manner in which we manage all our natural resources.

Whether it is a discussion of a particular watershed, the outline of multiple pathways of toxic loadings, or the description of the amazing degree of biodiversity within the Great Lakes basin, we hope the reader of this year's annual report will detect at least the faint outline of an ecosystem approach.

For the second year in a row, I want to offer my personal thanks to my staff in the Office of the Great Lakes, and all the staff of the Michigan Department of Natural Resources, for their hard work and keen insight in the preparation of this report. I also salute our guest contributors for their fine articles. They help us accomplish the impossible — a government document which is a pleasure to read! I particularly want to thank Martha Waszak for serving as virtual publisher and editor on the project.

G. Tracy Mehan, III, *Director*
Office of the Great Lakes
Department of Natural Resources

Table of Contents

Great Lakes — Great People 1
John Engler, Governor of Michigan

On Managing a Total Ecosystem 3
G. Tracy Mehan, III, Director, Office of Great Lakes

Table of Contents 5

Earth Day Plus 25 Years:

Earth Day Plus 7
Tom Washington, Executive Director of the Michigan United Conservation Clubs

Going Where No Man Has Gone Before 10
F. Patrick Nixon, Manager of Water Quality Regulation, Ford Motor Co.

Michigan Makes Progress On Great Lakes Clean Up — Now Comes the Hard Part 11
Brett Hulsey, Director, Great Lakes Program, Sierra Club

Guest Contributors:

The Rouge River: A National Model for Watershed-Wide Pollution Control 13
Congressman John D. Dingell, U.S. House of Representatives

Remedial Action Plans Provide Vital Lessons for Restoring the Great Lakes 15
Thomas L. Baldini, United States Section Chairperson, International Joint Commission

Great Lakes Shipping 18
George J. Ryan, President, Lake Carriers' Association

A Creative Solution: The Tollgate Drain Project 21
Patrick E. Lindemann, Ingham County Drain Commissioner

Pollution Prevention:

Michigan Great Printers Pilot . . . A Pollution Prevention Initiative 23

The Chlorine Debate:

Investigating Chlorine 24
Gordon K. Durnil, Past United States Chairman of the International Joint Commission

The Chlorine Issue 27
Dr. Lawrence J. Fischer, Director, Institute for Environmental Toxicology, Michigan State University

Chlorine: Part of the Fabric of Modern Life 29
Andrew J. Such, Executive Director, Michigan Chemical Council

Ecosystem Approaches:

Mercury 31

Great Waters 33

Great Lakes Biological Diversity 34

Watershed Approaches:

Nonpoint Sources of Pollution 36

Lake St. Clair 1994 Beach Closings 38

Lake Michigan Mass Balance Study 41

Lake Erie Lakewide Management Plan 42

New Hope for the Saginaw Bay Watershed 43

Chicago Water Diversion 45

The first Earth Day, April 22, 1970, was a call to arms. In the 25 years following, much has been done to educate the inhabitants of "spaceship earth" in the restoration and preservation of our natural resources. Unfortunately, we have also discovered that ecosystem integrity involves far more than clean air and water. We are just beginning to understand the intricate components and relationships that constitute a vital ecosystem. The following three contributions provide an overview of the progress made and the challenges to be met from authorities who have been in the forefront of the conservation and environmental movements.

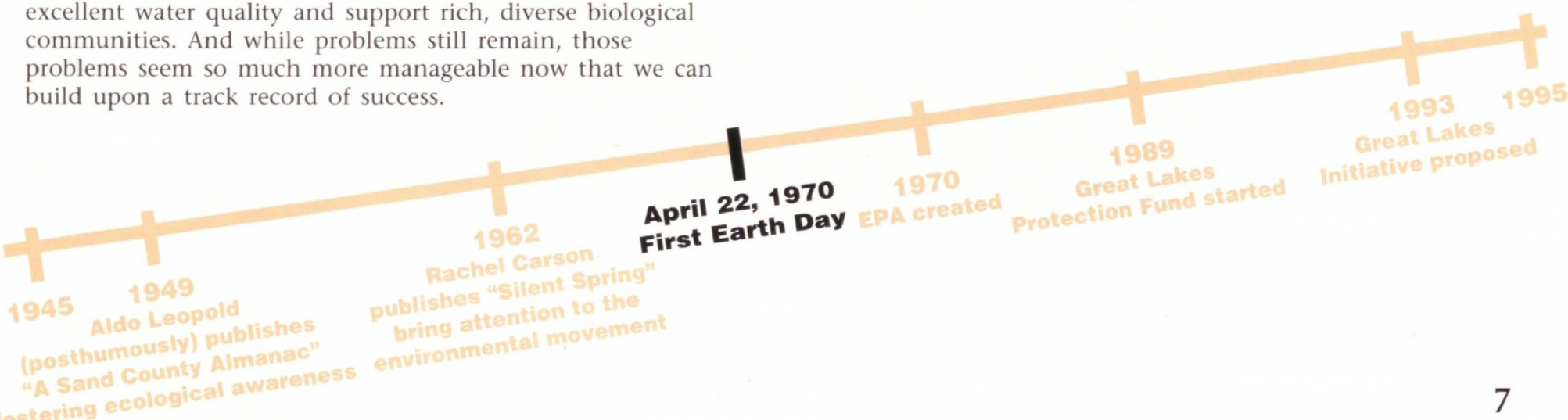
Earth Day Plus 25 Years:

Earth Day Plus

by
Thomas Washington

In the nearly three decades that I've been involved in Great Lakes issues, the region and its people have gone through some profound changes. Lake Erie has been brought back from the brink of ecological death to reclaim its place among the greatest freshwater fisheries in the nation. The remaining lakes, thought by many to have been close behind Erie on the road to oblivion, now enjoy excellent water quality and support rich, diverse biological communities. And while problems still remain, those problems seem so much more manageable now that we can build upon a track record of success.

On this 25th anniversary of the first Earth Day, we would all do well to sit back and reflect on the changes of the past quarter century, for many of the lessons we will learn are every bit as valid today as they were in 1970. Although we can in part attribute our success to such things as advances in technology and multibillion dollar investments of public and private funds in wastewater



treatment technology, this view trivializes the human element in the progress we've made. Instead, I prefer to assess our collective performance in terms of the three most basic building blocks of our success; creativity, collaboration and commitment.

The creativity we've shown in dealing with Great Lakes problems is a landmark in the history of human achievement. As our understanding of the intricacies of our natural resources grew in the decade of the 1970's, we quickly applied our talents to forging solutions even as new challenges had barely begun to unfold. Resource management principles were put into action by decade's end that had been mere theory when Earth Day was first conceived. We were moving swiftly toward solutions to problems that, 10 years earlier, we didn't even know we had.

In the decade of the 1980's and into the 90's, a changing society and shifting priorities have taxed the creative energies we first tapped in those enthusiastic days of the 70's. So far, we have met each new challenge with success, even as our problems have become more complex and solutions more elusive. Now, as then, we bring to bear on each new question some of the nation's most innovative minds in the fields of science, technology, education and public policy. We've every reason to be hopeful for the future.

As any public policy question is addressed through our many institutions, collaboration is also an essential ingredient of success. The Great Lakes comeback we've enjoyed depended in large measure on collaborative efforts involving all levels of government and citizens from all walks of life, from local to international, from rural to urban. The 1970's saw more natural resources protection initiatives advanced than any decade before or since, with Michigan proudly leading the way. The partnerships we formed to direct our energies toward reclaiming our lakes still serve as useful models and many of the agreements reached through careful deliberation remain as sound today as they ever were.

In the field of environmental policy, the federal Clean Water Act, first passed in 1972, remains among the most comprehensive and successful environmental protection efforts undertaken by any nation on earth. No single action deserves more credit for giving us back the Great Lakes we once knew. Superimposed on this framework of local, state and federal law are the Great Lakes Water Quality

Ecology Flag: Decals of this symbol of the first "EarthDay" were offered by LOOK magazine for 25 cents each in 1970.

Agreements of 1972 and 1978, signed jointly by the United States and Canadian governments to pledge the cooperation of each nation to work toward the resolution of Great Lakes problems that threaten this international treasure. The joint efforts undertaken by state and federal agencies on both sides of the border to honor their terms stand today as a model of international cooperation for protecting shared natural resources.

But all of the laws and agreements and all of the creative energy available would have done nothing without that most essential element of human endeavor, commitment. And it is in this area that the people of the Great Lakes have excelled. For years, as often as necessary,

the citizens of Michigan, and those of our sister states with which we share these lakes, have constantly demonstrated our commitment to do whatever is necessary to insure their protection. From citizen to congressman to corporate executive, we have claimed these lakes as our home and provided selflessly our time, money and talent to guarantee that we have something of value to pass on to our children.

It is this part of the equation of success that I am most proud of and the one that fills me with the greatest hope for the future. The remnants of decades of abuse and neglect are persistent and, despite our successes, there are new challenges looming on the horizon. Meeting these challenges will entail finding answers to complex scientific questions we can only now begin to define, and developing new ways to bring consensus back to public debate. It will require each of us who love the lakes to carefully weigh our hopes and desires against the needs and abilities of others, because nothing of worth is ever achieved without cost.

I remain confident that the people of the Great Lakes region will meet each new challenge with the same creativity, collaboration and commitment that have characterized our efforts in the past. And I also hope that in the distant future, perhaps on Earth Day's centennial, a new generation yet unborn will look back upon our efforts with respect and with gratitude. I hope that they will learn from our successes and failures, and will, in turn, pass on to their children this timeless treasure we know as the Great Lakes with the same pride that we now feel. Such a lasting legacy will, God willing, be our most precious gift to the Great Lakes I have known and loved.

Tom Washington is Executive Director of the Michigan United Conservation Clubs and President of the National Rifle Association

1918: The first report of the International Joint Commission is issued stating, "... situation along the frontier is generally chaotic, everywhere perilous, and, in some cases, disgraceful." Great Lakes nearshore waters were reported to be, "unsightly, malodorous, and polluted."

Earth Day Plus 25 Years:

Going Where No Man Has Gone Before

by
F. Patrick Nixon

Twenty-five years, since the first Earth Day, is a long time. Long enough for us to learn what makes environmental management work and what doesn't. Thus, it is altogether appropriate that we now re-assess and make the appropriate mid-course corrections. We should think carefully about the following principles:

Environmental practice is a people business. Certainly, there are technical questions and challenges before us. But it seems that 90% of what happens depends upon the people, and only 10% on the issue. This means that, while applying technical expertise, we need to learn how to better deal with each other — notably by improving our skills at negotiation and consensus building.

Government regulation isn't the answer. We've built a regulatory system that consists of thousands of pages of laws and regulations that other thousands of wise men can't understand or agree upon. Who can seriously say that this is the way to solve our environmental problems? The truth is that it might prevent some things from going wrong, and soothes our psychological need to "do something", but does little to help things go right.

Perception becomes reality. Too often we shoot from the hip without checking our facts or carefully considering the consequences. Over the years, we've encountered a number of environmental "scares" that turned out to be false or exaggerated. As a result, we've wasted time and resources that should have been focused on other problems.

Our focus is too narrow. Environmental problems used to be easily identified, localized, and easily attributable to one source. The traditional approach was to find it, identify a responsible party, and fix it — normally with some kind of waste treatment. Each of us has his own vision of success. But we are now finding that no single person has the right answer because the problems, responsibilities, and consequences of various actions are too complex for a single individual to comprehend.

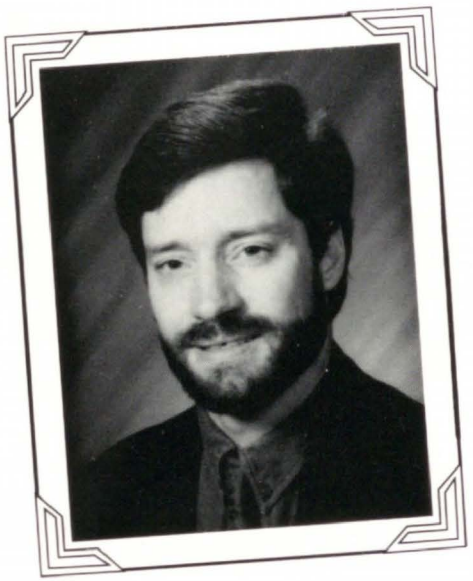
We need a better way. Two ideas come to mind. Better risk assessment could help by making our thought processes more methodical and focusing our precious time and resources on confirmed problems of clear significance, where they really count. The second should be a shift away from the old parochial vision approach to a more collegial, process-based approach that enlists the talents of many people. If the process is right, the results will take care of themselves.

F. Patrick Nixon is Manager of Water Quality Regulation for Ford Motor Company

Earth Day Plus 25 Years:

Michigan Makes Progress on Great Lakes Clean Up — Now Comes the Hard Part

by
Brett Hulsey



Last fall I had the opportunity to visit one of Lake Erie's beautiful islands. That's right, Lake Erie, the one that was pronounced dead just 25 short years ago. We swam and boated in the water — it was clear and warm. This should remind us that progress to protect the people who drink, fish, and swim in the waters of the Great Lakes is not only possible, it is happening.

Scientists at the recent State of the Lakes Ecosystem Conference held in Detroit said that the main reason Lake Erie is cleaner is because Michigan and other states are reaching the goals set out in the Clean Water Act and the Great Lakes Water Quality Agreement. We have achieved one of those goals; the reduction of phosphorus pollution, the detergent and fertilizer that caused the lake to die. This proves that we can make progress if we work together, do not deny the problem, and move forward. But, in some ways, phosphorus is an easily solved problem. Much of the pollution that now pours into Michigan's lakes and fouls our beaches, threatens our drinking water, and poisons our fish, runs off our lawns and farms, and rains from the sky.

Protecting the Great Lakes has never been more important. In 1993, more than 100 Wisconsin residents died, and 400,000 became sick from drinking Lake Michigan water contaminated with a deadly parasite that came from pollution running off farmers' fields and city streets. It is clear we cannot wait to deal with these problems. Moving forward with tough measures to clean up all sources of pollution — pipes, farms, and city streets — will protect the millions of people who obtain their drinking water from the Great Lakes.

In the last year, Michigan has made some progress toward Great Lakes clean up, but we still have problems we must solve in order to restore the Great Lakes:

1. Support for the Great Lakes Initiative (GLI) by Governor Engler and the Michigan Department of Natural Resources (DNR) has been an important step toward Great Lakes protection. We should implement the GLI as a regulation, not as guidance, to make other Great Lakes states live up to the standards that protect the water and fish.

2. Michigan should move forward to control other sources of toxicants, including: polluted runoff, contaminated sediments, and toxic air pollutants. Collectively, these are the largest sources of persistent toxics in people, fish, and wildlife.

3. Clean Air Act implementation is critical to the health of the Great Lakes. Michigan has submitted its package of new laws to the Environmental Protection Agency (EPA), thus avoiding immediate federal sanctions. However, the state's full Clean Air implementation program is lagging far behind federal deadlines, and serious questions remain regarding the adequacy of program funding and provisions, making federal approval uncertain.

4. DNR reorganization threatens Michigan's ability to protect the Great Lakes. The EPA recently informed the Governor that all changes resulting from the reorganization in key federal programs like water quality, air quality, wetlands, and hazardous waste will undergo a full review, including federal notice and public involvement. The public should scrutinize every element of this reorganization action, since they are losing many of the programs and laws that protect their health. Until it is clear that the DNR changes meet federal requirements, Michigan water discharge permits and pollution permits are at risk.

5. The progress on Remedial Action Plans (RAPs) has been slow, but we are starting to see accomplishments. We need a more cooperative approach on the binational RAPs and movement forward with clean up at Manistique and other critical harbors.

Michigan is a key Great Lakes state, and its leadership in Great Lakes protection is sorely needed. Michigan has the opportunity to lead the region toward strong water quality standards through the GLI. Michigan's voice needs to be clear in support of GLI regulations, including the next phase addressing polluted runoff.

Michigan also has an opportunity to revisit its DNR reorganization as the EPA undertakes its formal review. The state's long range capability to properly protect the Great Lakes hinges greatly on the ability of its citizens to participate as the stakeholders in environmental decision making.

Brett Hulsey is Director of the Great Lakes Program for the Sierra Club, one of the nation's oldest environmental groups.

Guest Contributors:

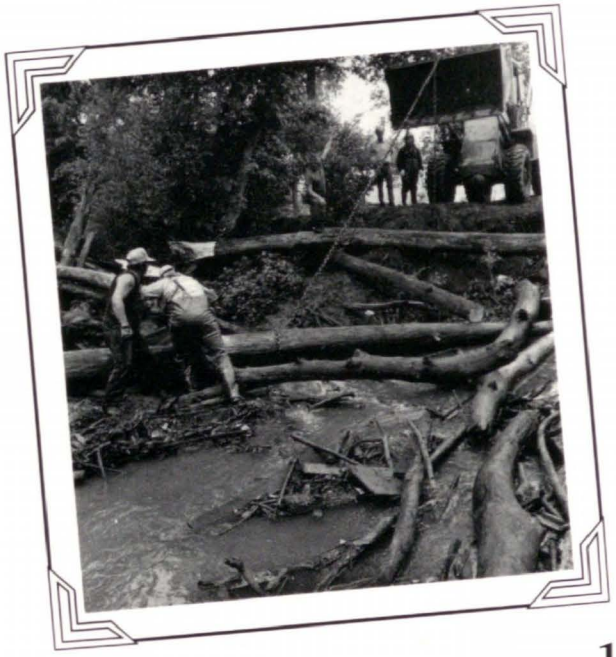
The Rouge River: A National Model for Watershed-Wide Pollution Control

by
Congressman John D. Dingell

It has been more than 20 years since the passage of the original Clean Water Act, which was approved by Congress to protect and preserve our nation's waters after decades of pollution. During the 1960s, it was not unheard of for Great Lakes waterways to catch on fire. Entire species of fish and other aquatic life disappeared within a couple of generations. As it was clear that the Great Lakes were no longer safe for human use, no single point of Great Lakes contamination was worse than the Rouge River.

With the passage of tougher laws to promote the clean up and maintenance of our lakes, rivers, and coastlines, government officials at all levels worked with industry and municipal waste facilities to severely limit pollution from point sources. The Rouge River was identified as one of 43 "areas of concern" in the Great Lakes by the International Joint Commission (IJC). By the mid-1980s, despite the progress made in removing point-source contamination, it was clear that much more work was needed if the Rouge River was to ever again be part of a safe and healthy environment in southeast Michigan.

To determine exactly how much work was required and how much it would cost, I asked the General Accounting Office (GAO) to determine exactly how big a clean up our communities faced to comply with the Clean Water Act. To my surprise, GAO reported that the total cost would exceed $1 billion, and possibly rise toward $2 billion. The biggest challenge: to eliminate the discharge of untreated raw



Rouge River clean up

sewage through more than 150 combined sewer overflows (CSOs). As local and state officials began work on a Remedial Action Plan (RAP), it was clear that the job could not be done without major Federal financial assistance.

Beginning in 1990, Congress approved funding for the Rouge River National Wet Weather Demonstration Project. The Rouge Project is a comprehensive, multi-year program designed to demonstrate innovative clean up technologies that can be applied to other American watersheds. The Rouge Project represents the first national effort to undertake a watershed approach in managing polluted discharges during wet weather and dry weather periods. It is expected that by 2005, CSOs and other raw sewage flows will be eliminated, improving significantly the usefulness of the river to more than 1.5 million people who live in the Rouge watershed.

With the highest population of any watershed in Michigan, many of the basin's 48 communities have a lot of work ahead, and the cost of this work is significant. Since 1990, the Congress has approved almost $300 million in direct grants to the Rouge Project, which is administered by Wayne County's Department of the Environment. Together with monies from the EPA's Clean Water State Revolving Fund (SRF) and local matches, many cities have begun to break ground on the construction of retention basins and other facilities to allow the treatment of pollutants from all sources. The result will be a vast improvement in the condition of the lower Great Lakes, a water supply source to millions within and outside the Rouge watershed.

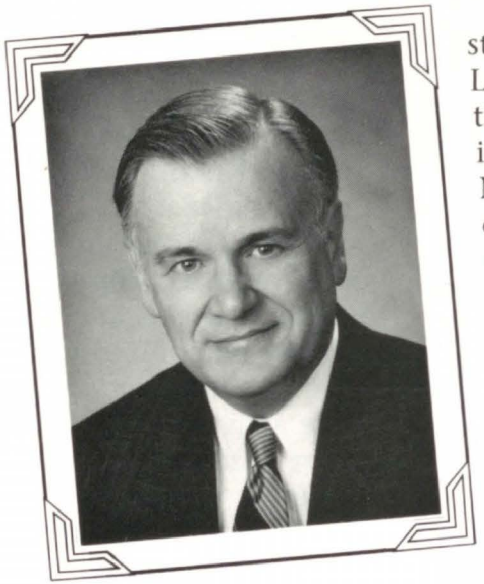
When I was a kid, I used to play and fish in the headwaters of the Rouge River. While the Rouge will never again be pristine, we have an obligation to ours and future generations to make sure it can continue to be a safe and accessible community resource. One of the most positive aspects of the clean up has been the strong commitment and teamwork exhibited by all of the parties, with strong leadership and support from Wayne County, EPA Region 5, and the Michigan Department of Natural Resources. Working together with the local communities, these agencies have demonstrated that regional cooperation in southeast Michigan is not only possible — it gets the job done.

Congressman John D. Dingell represents Michigan's 16th District in the U.S. House of Representatives and has sponsored numerous environmental projects.

Guest Contributors:

Remedial Action Plans Provide Vital Lessons for Restoring the Great Lakes

by
Thomas L. Baldini

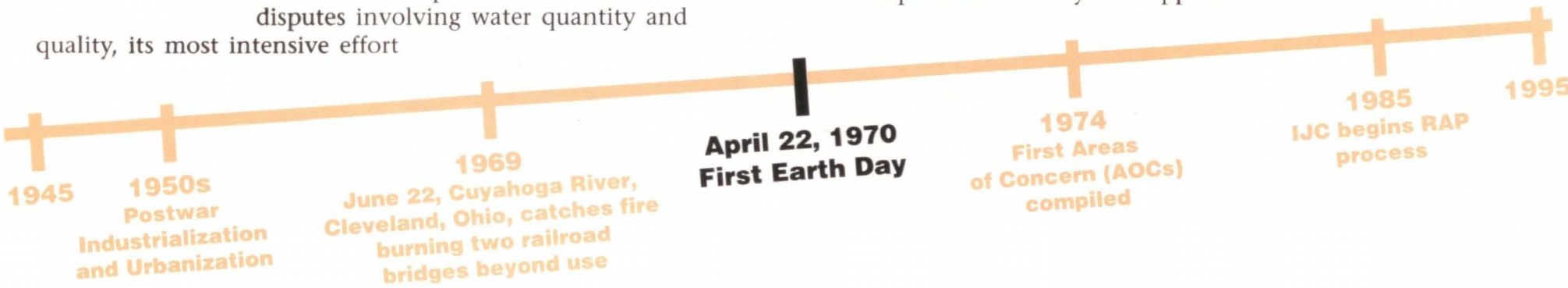


Michigan is the only state fully within the Great Lakes drainage basin. Since the Commission's creation in 1909, no one from Michigan had ever served on the International Joint Commission until my confirmation as U.S. Section Chairperson in April, 1994. While the Commission has responsibilities along the United States-Canada boundary from Maine to Washington State to help prevent and resolve disputes involving water quantity and quality, its most intensive effort

International Joint Commission
Commission mixte internationale

continues to be assessing progress to restore the integrity of the Great Lakes basin ecosystem.

In my short tenure on the Commission, I have discovered that it is a unique institution, which operates in consensus mode and attempts to develop advice that is in the best interest of both nations. The governments of Canada and the United States have called upon the Commission to report every two years on progress or lack of progress that the two governments have made under the 1978 Great Lakes Water Quality Agreement. The Agreement is a remarkable document that requires both nations to take a comprehensive ecosystem approach



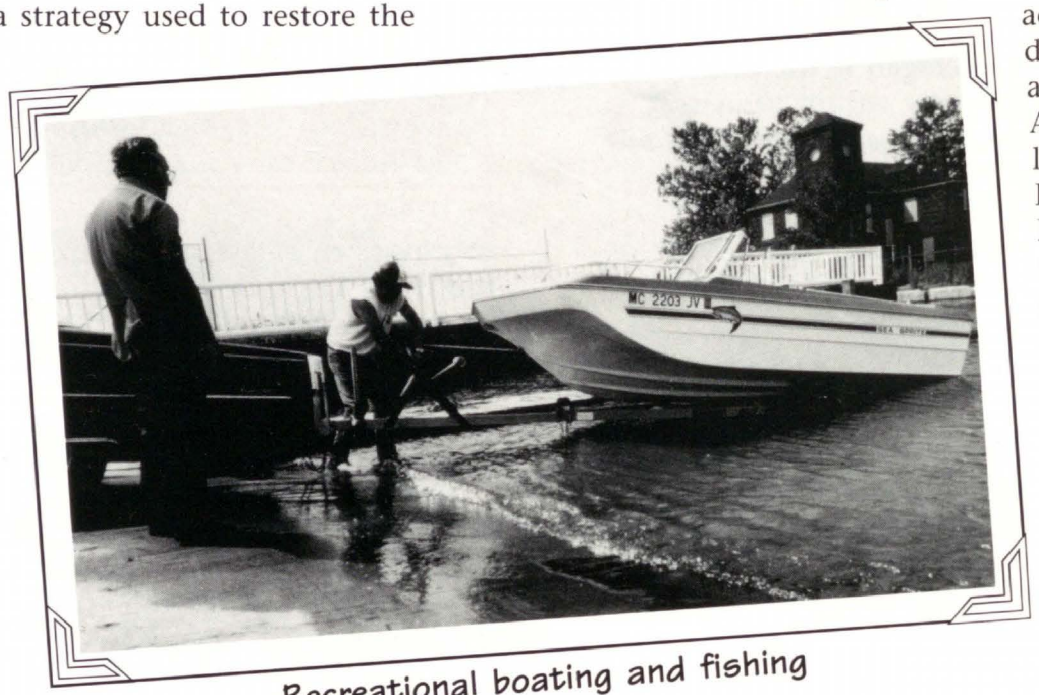
to protect and restore the quality of the water of the Great Lakes basin. Because of the extensive nature of this mandate, the Commission's recommendations are often long-term in nature and viewed as far reaching.

The Commission uses many measures to gauge the state of the Great Lakes and to establish priorities to achieve the goals of the Agreement. One priority during this biennial reporting cycle is to identify indicators of ecosystem health that could help to track progress in a consistent and efficient manner. I have discovered that the Remedial Action Plan (RAP) process, a strategy used to restore the most critical "Areas of Concern" across the basin involving thousands of volunteers, is one of the best tools we have to help us implement the Agreement.

The first list of Great Lakes Areas of Concern was compiled in 1974 by the Commission's Great Lakes Water Quality Board. The board reported each year on the Areas of Concern, but it was not enough to simply recognize year after year that these areas were seriously degraded. If the objectives of the Agreement were to be met, remedial programs would have to be developed and funded.

Thus, in 1985, as a result of being challenged by the Commission, the Water Quality Board recommended that the Great Lakes states and provinces develop and implement RAPs as a way of moving past what had, in effect, become a bureaucratic reporting exercise. These RAPs were to be systematic, comprehensive and consistent with the ecosystem approach of the Great Lakes Water Quality Agreement.

A historic milestone was passed in 1994, when the Collingwood Harbour (Ontario) RAP team submitted its final report and the Commission determined that conditions had indeed been restored. Collingwood Harbour is the first of the 43 Areas of Concern to be taken off the list. While Collingwood Harbour did not have to address the degradation from decades of heavy industrial activity that exists in some Areas of Concern, the lessons learned are applicable to other RAPs across the basin. These lessons include the importance of extensive public involvement in defining long and short-term goals. This involvement is an educational exercise for the community and fosters environmentally responsible activities.



Recreational boating and fishing

Another lesson from Collingwood is that of securing cooperation among levels of government and the private sector as the most direct and effective way to address all sources of pollution. Cooperation here facilitated the development and use of innovative environmental dredging technologies and a successful community water conservation effort. Active industrial involvement was also critical because it helped them redesign their production processes to reduce significant sources of pollution. These lessons of involvement are

applicable for all RAP's and Michigan's 14 Areas of Concern. They can also be applied on a larger scale, as to address Lakewide Management Plans to restore ecosystem health on a whole-lake basis.

The critical lesson of the RAP process for me is that by working together we can make improvements and progress toward restoration of ecosystem health. Government is limited in what it can do to achieve broad local goals to restore and preserve the ecosystem. In the end, shared responsibility and shared decision-making are keys to a successful effort.

A report on the status of the other 42 Areas of Concern will be reviewed at our next Biennial Meeting on Great Lakes Water Quality, which will be held in Duluth, Minnesota, September 23-26, 1995. This meeting is open to the public and is the first time the Commission will have held its Biennial Meeting on Lake Superior.

Thomas L. Baldini is United States Section Chairperson of the International Joint Commission

The Great Lakes provide over 10,000 miles of coastline

Guest Contributors:

Great Lakes Shipping

by
George J. Ryan

Environmental considerations were a major part of the Lake Carriers' Association (LCA) activities in 1994. The Association continued its Voluntary Ballast Water Management Program and undertook a pioneering study of cargo sweepings to prove their harmless nature.

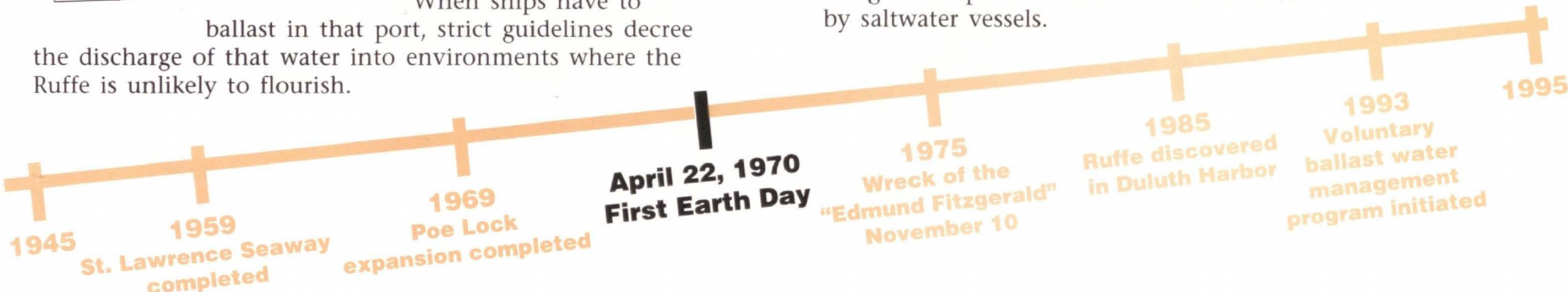
The Voluntary Ballast Water Management Program was instituted in 1993 to stem the migration of the European River Ruffe from its current habitat in western Lake Superior. In essence, the plan prohibits taking on ballast water in Duluth/Superior Harbor. When ships have to ballast in that port, strict guidelines decree the discharge of that water into environments where the Ruffe is unlikely to flourish.

Ruffe

From a ship operators' viewpoint, the program has been an unqualified success — there have been no reported findings of Ruffe in the lower Great Lakes.

In total, however, efforts to control the spread of the Ruffe have been less successful. The fish is migrating along the southern shore of Lake Superior much faster than imagined, largely because the state of Wisconsin declines to use piscicides to treat its rivers and streams. If Michigan doesn't judiciously treat rivers and streams with piscicides, the Ruffe will spread south as fast as it can migrate.

In the long run, the Great Lakes system may have to learn to live with the Ruffe and several other non-indigenous species which were introduced by saltwater vessels.



However, the U.S. Coast Guard has instituted a ballast inspection program for saltwater vessels entering the system and hopefully there will be far fewer introductions of non-indigenous species in the years ahead. At a Congressional hearing on the problem of ballast water transport of non-indigenous species, LCA promised full cooperation in testing new technologies as they are developed. This problem must be solved, both from an environmental and operational viewpoint. If ships can't ballast, they can't operate.

1679: The "Griffon", the first commercial ship on the Great Lakes, is launched on Lake Erie.

1921: Lamprey eel spreads from Lake Ontario to the other Great Lakes via the Welland Canal.

If the Ruffe control efforts illustrate the problems of dealing with many agencies and individual states, the issue of Cargo Residue underscores the ability of carriers and the U.S. Coast Guard to respond quickly and decisively. When a definitional problem in an international treaty threatened to ban the washdown of cargo sweepings, industry and the Coast Guard were able to immediately develop an interim program that protected the environment while keeping commerce flowing on the Lakes.

For those unfamiliar with the issue, the loading and unloading of dry-bulk cargos such as iron ore, coal, stone . . . always leaves a minute amount of cargo dust or tiny chips of the product itself on the ship's deck and in the tunnels underneath its cargo holds. Quantities of water, used for dust control, or to facilitate unloading, also collect in the ship's tunnels. For safety reasons, these cargo sweepings and tunnel water must be removed from the ship. For decades, the practice has been to hose the cargo sweepings overboard and pump the tunnel water into the Lakes.

The Coast Guard waivers set some restrictions, but still enabled shipping to continue this season while LCA engaged experts to determine the environmental impacts of

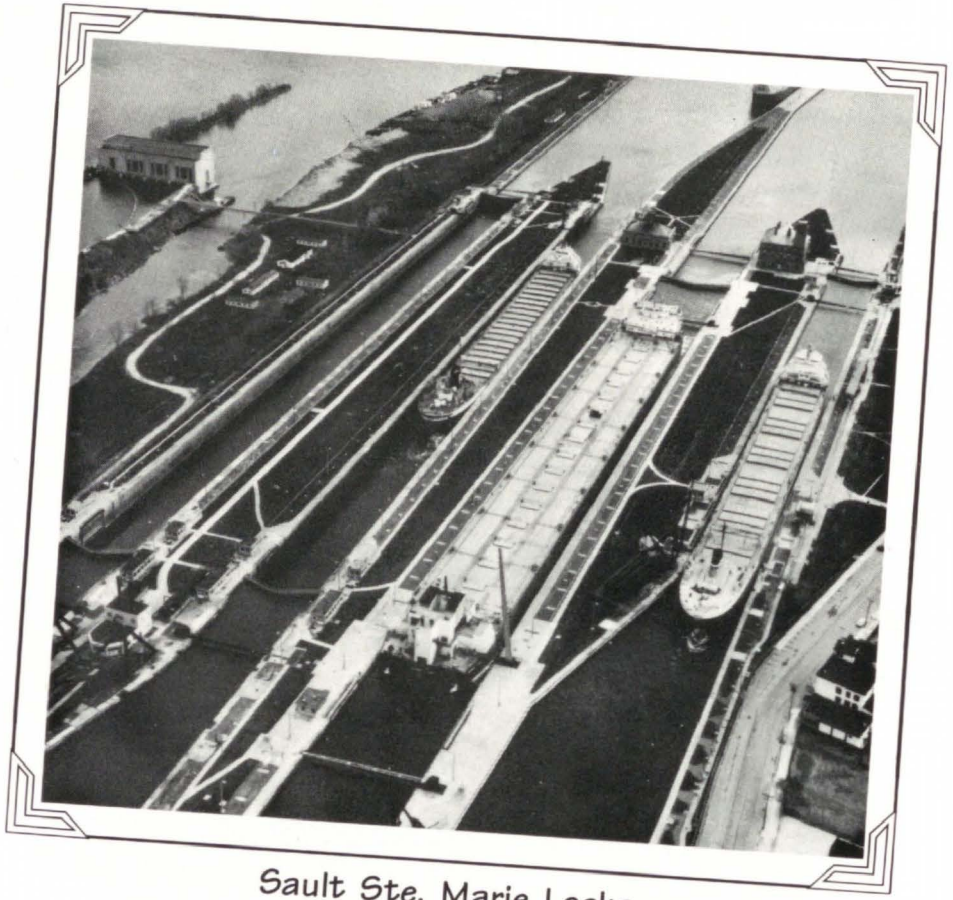
the cargos ships carry. These investigations have determined that most cargos are benign, and in all instances, the amount swept or pumped overboard is so minute as to have no adverse environmental impacts.

It should also be noted that this extensive research became necessary because of a treaty aimed at ending the discharge of plastic and cargo tunnage into the oceans. Cargo residue washdown was never considered a problem on the Great Lakes.

The close of the 1993 shipping season and the resumption of navigation in late March marked the beginning of the new environmental protections contained in the agreement on a fixed navigation season through the Soo Locks. The locks now open on March 25 and close on January 15. During the periods of ice cover at the open and close of navigation, ships reduce their speed in certain key stretches of the St. Marys River to minimize the impacts on fish eggs and spawning grounds.

LCA is proud of its environmental record and commitment. As U.S.-Flag operators, our members' vessels are constructed and operated to the world's highest safety standards. As Jones Act carriers, our crews are licensed and documented by the U.S. Coast Guard. The U.S. Cabotage laws are the best guarantee that waterborne commerce on the Great Lakes will respect the environment.

George J. Ryan is President of the Lake Carriers' Association representing all operators of self-propelled vessels working the Great Lakes.



Sault Ste. Marie Locks

Guest Contributors:

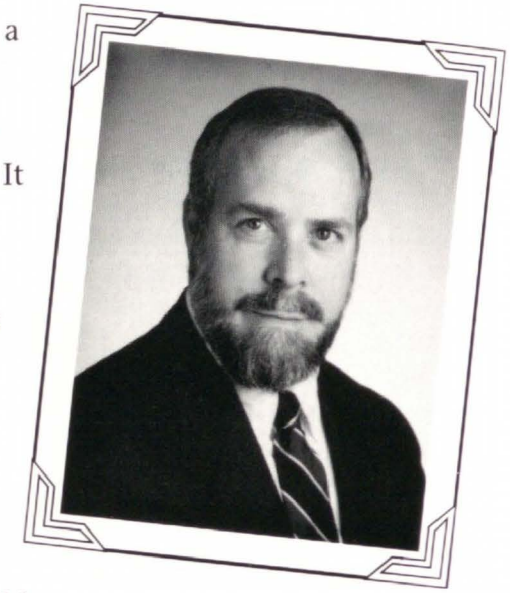
A Creative Solution: The Tollgate Drain Project

by
Patrick E. Lindemann

The Great Lakes' water quality is, in great part, a function of their tributaries. And those rivers and streams are a function of the drains that outlet to them. The water that is being deposited into the rivers comes from a variety of sources, including community sewer systems. In an effort to control the pollution from Combined Sewer Overflows (CSOs), many cities are either in the construction process of separating their sewer systems, or are planning to do so in the next few years. However, this effort will not provide adequate abatement of non-point source pollution that is the result of storm water runoff from urban land uses, such as parking lots, fertilizers, and pet wastes. The storm water runoff will enter the rivers unabated, carrying its load of non-point source pollution directly to the Great Lakes.

The issue of non-point source pollution becomes more important each year. When this increased emphasis is combined with other variables, such as many ongoing CSO projects, the unique characteristics of Michigan's geology, and a time when Michigan's wetlands are being destroyed at an alarming rate, a rare opportunity arises for a creative way to address this environmental issue.

As Ingham County Drain Commissioner, I am faced with the need for an urban storm/sanitary sewer separation project located in a dense urban area which is far from the traditional outlets for such projects, the rivers. The Tollgate Drain Project, in Lansing Township, in the northeast corner of the City of Lansing, is a creative project that will provide a cost-effective, pro-active solution to the problem of urban runoff. It will create wetlands, and will utilize one of Michigan's natural geological formations, the Mason Esker, as a final outlet for storm water runoff, rather than the Grand and Red Cedar Rivers.



By using a river as its outlet, the cost of the Tollgate Drain Project could be from $14 million to $20 million, depending upon the discharge route chosen. This cost would have been apportioned to the Tollgate Drainage District, and would have created an unacceptable financial burden to its residents. Clearly, an alternative had to be found.

The City of Lansing agreed to accept the sanitary water, once the separation was completed. The storm water discharge then became the problem. Several alternatives were examined, but the one which was most economically

and physically feasible was to take advantage of the Mason Esker as a recharge outlet for the drain. However, using this alternative created many other obstacles. For example, how do we clean the water prior to re-charging? How do we use the esker in a way as not to disrupt the Groesbeck Golf course, located on the esker? And, by what means do we educate the neighborhood residents so as to reduce the potential for additional pollution inputs?

In answer to the first question, storm water will be polished while flowing though an 11 acre retention basin. This basin will consist of a newly-created wetland with grit chambers, sediment traps, water cascades, ponds, vegetation and a circulation system that is designed to extract pollutants from the water. The water will then outlet to the golf course.

Secondly, golf courses are frequently the biggest contributors of pollution to runoff because of their high use of fertilizers. Cooperation from the City of Lansing will allow for the golf course to be redesigned to accommodate up to 15 acres of new wetland area. These acres will contain cascades and flow patterns that will store up to 15 acre feet of water while providing extra polishing. The golf course will use the retained storm water for irrigation and will no longer rely on well water for this purpose. As a result of the project, golf play time will increase because of the redesigned, improved flow, and storage areas which will allow the water to evaporate. After all of this, any overflow will be recharged to the ground though the esker. This is an efficient way to transport, clean, and outlet the water in a manner that is environmentally-friendly, cost-effective, and efficient enough to solve the neighborhood's flow problems through creation of a total of 25-30 acres of urban wetland, when combined with the existing eleven acres of storage in Fairview Park. The total project cost will be reduced to about $5 million, for a savings of up to $10 million.

Finally and concurrently, a public outreach program will be implemented. It will teach users of the system how to reduce their pollution inputs and respond to the community's questions and concerns which arise through the duration of the project. Neighborhood meetings and distribution of educational materials will be ongoing. Knowledge is especially important because maintenance costs attributed to the project are assessed to residents of the district.

In addition, the eleven acre wetland retention basin will serve as a living classroom for use by local schools, neighborhood groups, service clubs and others. Its educational value to the community will be quantified, in part, through data collection activities which are designed to measure behavioral change over time.

The Tollgate Drain Project is an innovative, economical, and ecologically sound solution to an increasing concern over Michigan's cities' non-point source pollution of our water. Perhaps in Michigan, more than in any other state, because of our vast and cherished water resources, water quality is not just a concern. It is a responsibility which deserves a total commitment.

Patrick E. Lindemann is Ingham County Drain Commissioner

Pollution Prevention:

Michigan Great Printers Pilot . . . A Pollution Prevention Initiative

The Michigan Great Printers Pilot is part of a unique regional pollution prevention initiative. It seeks to make pollution prevention (P^2) the primary choice of the lithographic printing industry in meeting and exceeding its responsibilities to protect environmental and human health. The Great Lakes region is host to this initiative with other pilot projects located in Illinois, Minnesota and Wisconsin.

In 1993, the Council of Great Lakes Governors, the Environmental Defense Fund and the Printing Industries of America formed a team representing Great Lakes regulatory and development agencies, the U.S. Environmental Protection Agency, state and federal technical assistance providers, printers, suppliers and customers, and members of labor and environmental groups. This team reviewed regulations, permit and reporting requirements for all environmental media, to identify barriers and possible incentives to P^2 and general environmental protection. They have recommended technical, financial and regulatory assistance needed, and how best to provide it. The team released a report in July 1994 titled, *"The Great Printers Project: Recommendations to Make Pollution Prevention a Standard Practice in the Printing Industry."* The report encourages commitment to the Great Printers Principles, suggests restructured regulatory requirements, improves printers' access to information and technology, and provides information to print buyers on ways to make P^2 and environmental protection a natural part of doing business in the printing industry.

Each State Pilot is using the Great Printers Project report as the basis of action. The Michigan Great Printers Pilot is a partnership between the Michigan Department of Natural Resources, the Michigan Environmental Council and the Printing Industries of Michigan.

Pollution prevention projects such as the Great Printers Project can help realize the opportunities for source reduction by focusing beyond treatment and disposal, and considering multi-media management of pollution. Businesses need information and technical assistance to overcome institutional barriers and adopt source reduction practices. With the continued collaboration of the State Pilots and the Regional Team, the demand for continuous innovative P^2 technologies in the printing industry will be inherent for everyone working with or in the industry. The Michigan Great Printers Pilot may serve as a model of the methods in which P^2 can promote the economic development of an industry, while protecting the environment and human health.

Handpress

Typeface sample

Chlorine has been used for decades as a method of water purification for municipal drinking water supplies, and as a general disinfectant and bleaching agent. In combination with other elements, chlorine is used as an industrial feedstock to produce a myriad of products from paints, plastics and fertilizers to pharmaceuticals, cosmetics and sunscreens. But chlorine is also a component of a number of highly toxic, persistent and bioaccumulative products. Insecticides such as DDT; PCBs; and dioxins are examples of compounds which have prompted some to call for the total elimination of chlorine as an industrial feedstock. The following forum includes contributions from three authorities with individual perspectives on the chlorine controversy.

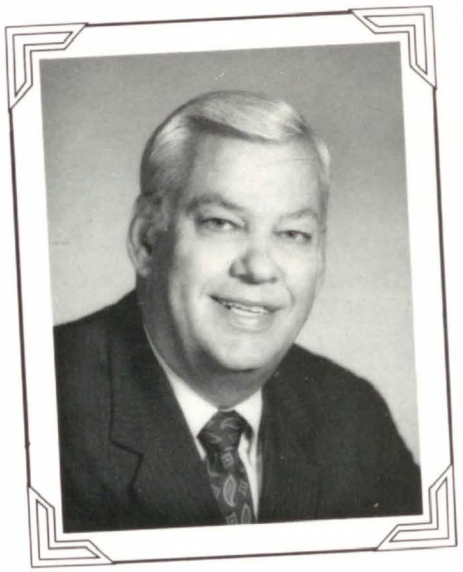
The Chlorine Debate:

Investigating Chlorine

by
Gordon K. Durnil

First, because the International Joint Commission (IJC) Water Quality Board informed the commission that maybe as many as one half of the really serious persistent toxic substances in the Great Lakes were chlorinated organics, and because the Science Advisory Board recommended that organochlorines be declared a hazard to human health, the IJC, on which I served, established a two track, multi-year, process to look at chlorinated substances and other persistent toxics. One track was a Virtual Elimination Task Force while the other track involved a series of Zero Discharge Round Tables. The task force looked at the total picture while the round tables examined specifics. Industry participation was hard to come by. We invited. We pleaded. But only at the final round table in Thunder Bay did anyone from U.S. industry attend, without participation.

The results of those exercises in 1990 and 1991, along with other investigations, led us to conclude that chlorine was indeed a common precursor for many of the substances which the United States and Canada have formally agreed it is their policy to virtually eliminate under a philosophy of zero discharge (Great Lakes Water Quality Agreement). The IJC then recommended an orderly process that would consider all socio/economic factors. The sunsetting process we recommended did not include the treatment of drinking water, waste water or the manufacture of pharmaceuticals (lobbyists created many fables about the recommendation). Among ourselves, we thought a time table of 50 years might be workable, but we thought industry, with government participation, should resolve the timing. The Chlorine Council in an Ottawa presentation told us a likely timetable might be as long as 30 years; later, in Windsor, they suggested 20 years. To us, the important thing was that a future date certain be set that would begin moving us away from being a chlorine dependent society.



The 1992 IJC recommendation went largely unnoticed until interest was stimulated for the 1993 biennial meeting, and then the focus was on just that one recommendation and did not give consideration to the preceding recommendations and dicta. Narrow focusing seems common in the environmental realm, which brings me to my reflections on the bigger picture having to do with some barriers to achieving environmental success without economic distress.

One barrier has to do with how scientists are trained and how they work; another with how governments regulate. It has to do with what some people on one side of an issue call bad science, while equally trained and bright people on the other side call it good science. It has to do with the current standard in the United States and Canada that, unless we can prove harm to human health with 100% certainty, we just keep on doing what we are now doing. A 90% certainty that a discharge might have the potential for harm to your child or grandchild is not now reason enough to exercise caution. I was pleased to

The Chlorine Atom

read in the report of the Michigan Environmental Science Advisory Board Chlorine Panel that "insufficient evidence does not prove lack of potential for harm."

Another barrier is the pervasive thought that we must weigh the potential for harm of individual chemicals one at a time, instead of looking at classes of chemicals. We are told by the two federal governments that somewhere between 60,000 and 200,000 chemicals are being discharged into the Great Lakes. No one really knows how many. We do know that most have not been tested for health effects and virtually none tested for effects other than cancer. Looking at these one at a time might be time consuming; a millennium might be a somewhat optimistic time frame.

Another barrier is the common argument that we do not have sufficient human data, that mice are different from humans. We say these things even though we get upset when we find that humans have been unknowingly tested and even though Congress refuses to enact legitimate human health studies relating to chlorine. Other barriers include jurisdictional grid lock and some 60,000 environmental laws to which business must adhere in the Great Lakes Basin.

Probably the largest barrier to environmental success without economic distress is the predominant official concentration on the end result of pollution instead of trying to prevent it in the first place. Most efforts have to do with remediation; with zillions of regulations on business; with an arcane permitting process designed as a revenue source; with recycling; with landfills and incinerators; with our national pastime of chasing waste. This official approach to pollution makes no sense to me. It penalizes the entrepreneur and is of debatable environmental good.

If we are truly interested in resolving environmental concerns, we must put more emphasis on preventative measures. To do that honestly, we must look very quickly, very fairly and very openly at the use of chlorine in our society.

Gordon K. Durnil, was United States Chairman of the International Joint Commission.

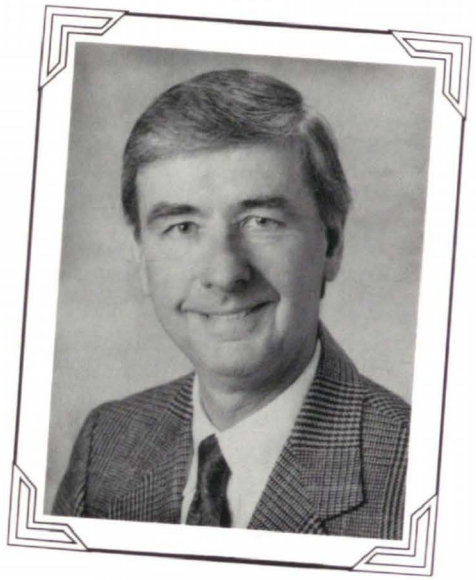
The Chlorine Debate:

The Chlorine Issue

by
Lawrence J. Fischer, Ph.D.

The call by the International Joint Commission (IJC), Greenpeace and other groups to ban the use of chlorine and chlorine-containing organic compounds as industrial feedstocks represents an extreme position taken to deal with an important environmental problem. While persistent, toxic compounds have the potential to adversely impact environmental and public health in the Great Lakes Basin, there seems little scientific basis or reason to focus on a complete chlorine ban to solve the problem. A fundamental evaluation of the role played by chlorine in toxicity produced by certain organic chemicals indicates that when chlorine is present in a toxic chemical, it is usually not the primary determinant of harmful activity. Rather, the presence of chlorine acts to either increase or decrease an inherent harmful activity which is primarily determined by the chemical's organic structure. In support of that point of view is the fact that there are many very toxic compounds, both natural and synthetic, that do not contain chlorine. This raises the question; if chlorine is not the primary culprit, why must we completely stop using it?

The arguments to ban chlorine center around the hazards from known persistent toxic chemicals which contain chlorine, e.g.: PCBs, chlorinated dibenzodioxins (2,3,7,8-TCDD), DDT, etc. These environmentally stable, persistent chemicals are toxic and present a threat to wildlife and humans exposed to sufficiently high concentrations. Chemicals of this type can accumulate in the food chain because of their lipid solubility, and their environmental persistence increases the possibility that harmful concentrations can be reached in humans and certain wildlife. Chemicals with potent toxic effects and persistence in the environment, whether or not they contain chlorine, should be identified and carefully controlled. This action has been taken for the chlorinated compounds of current concern. It is possible there are unknown persistent, toxic, environmental chemicals, some containing chlorine and others not, that must be identified and controlled. The technology to do this is available and it should be applied to the task.

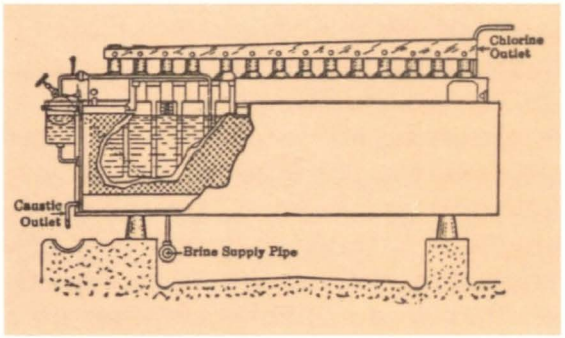


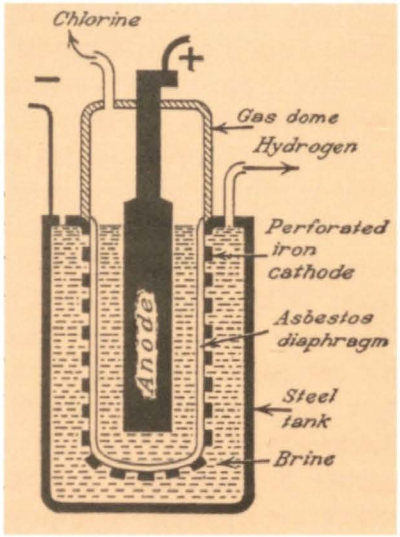
A decision on the appropriate use of specific chemicals such as chlorine requires an assessment of both risks and benefits. What are the benefits of chlorine? This element is a staple in industrial processes which create a myriad of useful products including plastics, drugs, and disinfectants. The life preserving effects of drugs produced using chlorine chemistry, and the purification of water by chlorine should be sufficient to give pause to anyone considering a ban of this element. It is stated by proponents of chlorine elimination that safe and effective alternative products and processes that do not involve chlorine are available at this

time. This is not correct. For example, equally effective substitutes are not available for drinking water purification. Also, alternatives to chlorine use often have not been sufficiently tested for safety. As an example, one might question whether adequate toxicity data exist for the byproducts of newly instituted oxidative processes for bleaching pulp and paper. It is asking for trouble to presume, in the absence of sufficient data, that substitutes are less harmful than a chlorine-related product or byproduct.

The Michigan Environmental Science Board spent six months studying the scientific basis for the proposal to eliminate the use of chlorine and chlorine containing compounds. The report prepared by the Board indicated that there was a need to focus on the elimination of input to the environment of persistent, toxic compounds, whether or not they contain chlorine. The Board concluded that many chlorinated compounds do not possess the hazardous properties of PCBs and dioxins, and are of comparatively little concern. In agreement with the IJC, the Board supported a review of the safety and benefits of all chlorinated compounds with input to the process from government, industry, and public interest groups. Adequate safety testing of alternatives to chlorine processes and products was imperative, according to the Board, prior to the initiation of the use of chlorine substitutes. It was also suggested that the methodology for testing chlorine products released to the environment be reviewed and upgraded, if necessary. This is required because current methods may not be sufficient to detect some of the most potentially harmful effects of chemicals like the dioxins. In summary, the position taken by the Michigan Environmental Science Board is that it agreed in part with the proponents of chlorine elimination, but did not concur with the major premise that a ban is required on the use of chlorine and chlorine-containing organic compounds.

Dr. Lawrence J. Fischer is Director of the Institute for Environmental Toxicology and Professor of Pharmacology and Toxicology at Michigan State University. He is also Chairman of the Michigan Environmental Science Board.





Modern Chemistry, 1936 — One method of producing chlorine gas from salt water. (Left) Nelson Cell sectional diagram (Right) Nelson Cell cross-sectional diagram

The Chlorine Debate:

Chlorine: Part of the Fabric of Modern Life

by
Andrew J. Such

Chlorine is a chemical that is used to purify water in 98% of the public water systems in the United States, to manufacture 85% of all medicines, and to produce 96% of all crop-protection chemicals. It is the basis for all things made from vinyl plastic, and is essential to the production and performance of thousands of other products.

In fact, chlorine chemistry is used to meet the most vital needs of modern life, including health care, food production and protection, building construction, transportation, high-tech electronics, and clothing.

Despite these many benefits, some people would like to reduce or eliminate all chlorine chemistry in our modern society — for any use, anywhere. Such a drastic proposal should concern all of us, for as a society, we rely on chlorine chemistry. With so much at stake — thousands of beneficial products and 45 million U.S. jobs in industries that depend on chlorine — this widely-used chemical must be evaluated rationally and scientifically.

In light of recent reports by the International Joint Commission (IJC) and Michigan Environmental Science Board (MESB), the chemical industry believes that evaluations of chlorine and chlorinated compounds should address risks constructively, take account of social and economic consequences, and involve all who would be affected by its outcome.

Through committed involvement, chlorine producers and users have made major improvements in the areas of safety, health and environmental performance over several decades. This knowledge and experience can make a valuable contribution to the dialogue, and we continue to be ready to participate constructively. All we ask is that decisions be based on sound science, weighing all the evidence in an even-handed manner with the goal of reducing risk from exposure to specific chlorinated compounds. Chlorinated chemicals have differing chemical and physical properties, which govern not only their value to society, but their potential behavior in and effect on the environment, which varies widely. Therefore, evaluations should include risk-benefit analysis of potential alternatives, as well as the risks of not having chlorine available to society.

Unfortunately, many of the objections to chlorine revolve around sweeping generalizations that equate all chlorinated compounds with the problematic few, such as DDT and PCBs. Such generalizations may receive public attention, but they are not grounded in good science, which establishes a hypothesis, tests it, and then makes decisions based on the results, rather than on unproven presumptions.

In fact, only the past use of a very limited number of chlorinated organic chemicals has been shown to cause adverse effects on wildlife. Since then, governments have restricted or banned the use of these chemicals. As a result, environmental concentrations of these few "bad actors" are declining. The chlorine industry is prepared to make tough decisions where problems are found. But creating public policy based on broad generalizations could lead to loss of products that improve the quality of life, without a comparable gain in environmental benefits.

The chlorine industry recognizes the risks posed by *some* chlorinated compounds, and is aware of the questions raised about others. Yet, it cannot be overemphasized that banning chlorine chemistry would be no simple task. Chlorine is one of the most widely used chemicals, and for good reason. If you have had a glass of water today, bought food wrapped in plastic, traveled in an automobile or airplane, or had a prescription filled, you have taken advantage of chlorine's versatility. In short, it is part of the fabric of modern society. Replacing chlorine with alternatives that do not perform as well and that deliver no proven environmental benefit would defy logic and common sense. Using scientific evidence as the basis for weighing up the risks and benefits of chlorinated compounds will ensure the health and safety of everyone, without imposing unnecessary costs and inconvenience.

Andrew J. Such is Executive Director of the Michigan Chemical Council

1920s: PCBs introduced primarily as electric insulators.

Ecosystem Approaches:

Mercury

Hg

Chemical symbol for Mercury. Hg: From the Latin "hydrargyrum" meaning "silver water".

Mercury, is a naturally occurring element. It is also present in over 3000 industrial, medical, agricultural and chemical applications. Examples include cleaning solutions, thermometers, fluorescent lights, batteries, blood pressure gauges and pesticides. In its naturally occurring state, it is present in trace amounts in coal and oil. Therefore, the primary atmospheric source of mercury is from combustion. The Environmental Protection Agency (EPA) has identified the most significant atmospheric source categories as medical waste incinerators, municipal waste combustors and utility boilers. Chronic exposure to methylmercury from fish consumption poses a risk to expectant mothers and wildlife. The fetus is especially sensitive to mercury, which can cause neurobehavioral deficits. Because of this risk, elevated levels of mercury in Michigan's fish, led to a state-wide fish consumption advisory in 1988 for all of Michigan's 11,000 inland lakes.

Alchemist symbol for Mercury. Both the alchemists' symbol and name for Mercury came from that of the Roman mythological messenger of the gods. The element was so named because of its fluidity.

Michigan continues to focus its efforts on mercury source identification and reduction, and has implemented the Mercury Action Plan. This Plan was drafted in response to the recommendations in the Michigan Environmental Science Board report, "Mercury in Michigan's Environment: Environmental and Human Health Concerns" developed at the request of Governor Engler. Commitments included in Michigan's Action Plan now being implemented include:

- Michigan Department of Natural Resources (MDNR) review and recommendations to the EPA on provisions required in the amended Clean Air Act, including a mercury study, utility study and Great Waters Program: The mercury study was released December, 1994, for MDNR review and comment. The final EPA study is expected to be submitted to

Congress in the summer of 1995. The utility study is expected to be submitted to Congress in November, 1995.

- Implementation of the Lake Superior Pollution Prevention Strategy through the cooperation of Michigan, Wisconsin and Minnesota: This strategy was developed to address the need for pollution prevention as an integral part of the International Joint Commission's Binational Program to restore and protect the Lake Superior Basin. This program is working toward the goal of zero discharge (or emissions) of toxic pollutants entering Lake Superior, with a specific focus on mercury. Projects that have resulted from this strategy include small business assistance on pollution prevention opportunities, mercury outreach and education concerning mercury and PCB containing materials, household hazardous waste collection programs and mercury stack emissions monitoring on known mercury sources in the Lake Superior Basin. An implementation report that summarizes funded projects and outlines the process for continued strategy implementation will be released in 1995.
- Formulation of the Michigan Mercury Action Plan as a product of the Michigan Mercury Pollution Prevention Task Force: The Task Force meets on a monthly basis and will develop a mercury pollution prevention strategy for Michigan.

It is theorized that the Hatter in Lewis Carroll's Alice's Adventures in Wonderland (1865) was "mad" as a result of mercury poisoning. Nitrate of mercury was used in the early production of felt used to make hats.

Ecosystem Approaches:

Great Waters

The Clean Air Act amendments, passed in 1990 by the U.S. Congress, included a requirement that the Environmental Protection Agency (EPA) identify and assess the extent of deposition of hazardous air pollutants (HAPs) to the Great Waters. The Great Waters include the Great Lakes, the Chesapeake Bay, Lake Champlain, and specific parts of the coastal waters designated under the National Estuarine Research Reserve System or the National Estuary Program. EPA's investigation resulted in the first *Great Waters Report to Congress* released in May, 1994. The report was required in part because of the growing concern, especially among residents of the Great Lakes, that aquatic ecosystems were vulnerable to the adverse effects of pollutants transported via the atmosphere. The first Great Waters Report documents the status of the science regarding sources of HAPs, transport mechanisms and the exposure and health risks to humans and wildlife.

Pollutants in the atmosphere come from man-made sources such as industrial processes, municipal incinerators, pesticide applications, and vehicle emissions; or from natural sources such as volcanic eruptions, fires, and wind eroded soils. The chemical and physical properties of the pollutants determine how far they can be carried from the source, and how they may be altered on the journey by exposure to light or temperature changes, or through chemical reactions with gases and other particles in the atmosphere. Pollutants are then deposited to the land and water surfaces either directly as dry deposition, or in conjunction with rain or snow in wet deposition. Pollutants deposited on land surfaces can then be carried into surface waters by storm runoff and snow melt. Once in the aquatic environment, pollutants may undergo further changes; various components will be incorporated into plant and animal life processes, deposited to the sediments, or volatilized to reenter the atmosphere. Our understanding of these complex processes is still developing, and will require additional monitoring and research.

An essential step toward reducing atmospheric loads of HAPs is to identify the sources and processes that release these compounds through the development of an air emissions inventory. Emission factors are derived based on measurements from representative sources. A networked computer system known as RAPIDS (Regional Air Pollutant Inventory Development System) is being developed by the Great Lakes States to provide data management of emissions information for 49 air pollutants of potential concern to the Great Lakes.

The information in the Great Waters report will assist in determining the extent to which air pollution contributes to the total loading of persistent toxic contaminants in the Great Lakes; in documenting the adverse effects to humans and the environment; and in evaluating the effectiveness of existing regulatory programs and the need for additional regulations. All the Great Lakes States are contributing to the Great Waters Program, along with EPA and the National Oceanic and Atmospheric Administration. The knowledge and experience of engineers from industry, manufacturing and municipal waste management will also be essential. Establishing new, national standards for the most serious HAPs will help ensure that our regional and state efforts to reduce toxic contaminants in the Great Lakes will be effective.

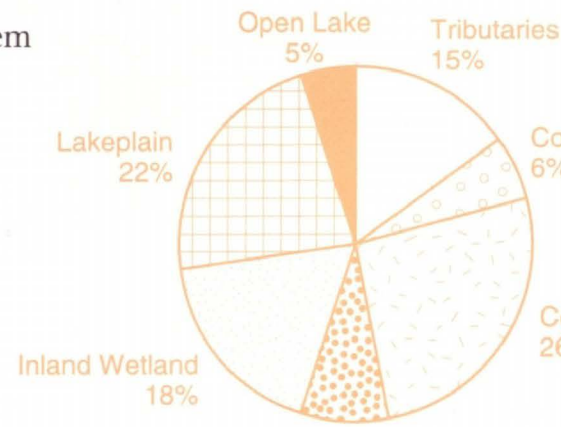
The Great Waters Report to Congress will be updated biennially, but because of the delay in publishing the first report, the next update is anticipated in 1995.

Great Lakes Biological Diversity

The Great Lakes basin, sculpted by glaciers and bathed in fresh water, supports a unique variety of ecosystem communities, rich in biological diversity. A surprisingly optimistic report, published in January, 1994, by The Nature Conservancy Great Lakes Program, attempts to define the character of the Great Lakes ecosystem and the importance of preserving its abundance of life forms. *The Conservation of Biological Diversity in the Great Lakes Ecosystem: Issues and Opportunities, 1994* is intended to provide a "first look" at the special biological diversity in the basin and those human activities that place it at risk. The document serves as a starting point for understanding and conserving those elements most critical to the maintenance of biological diversity.

Over 14,000 locations of high quality ecological communities and rare species were tracked by the ten Natural Heritage Data Centers operating in the basin. While not regarded as a comprehensive inventory, the report identified 131 elements within the Great Lakes basin which are judged to be imperiled, to some degree, on a global basis. Of these 131 elements of global significance, nearly half (47%) occur exclusively or predominately within the basin. Of the globally significant elements, 31 are natural ecological community types; the rest are individual species, subspecies or varieties, including 49 plants, 21 insects, 12 mollusks, nine fish, five birds, three reptiles, and one mammal.

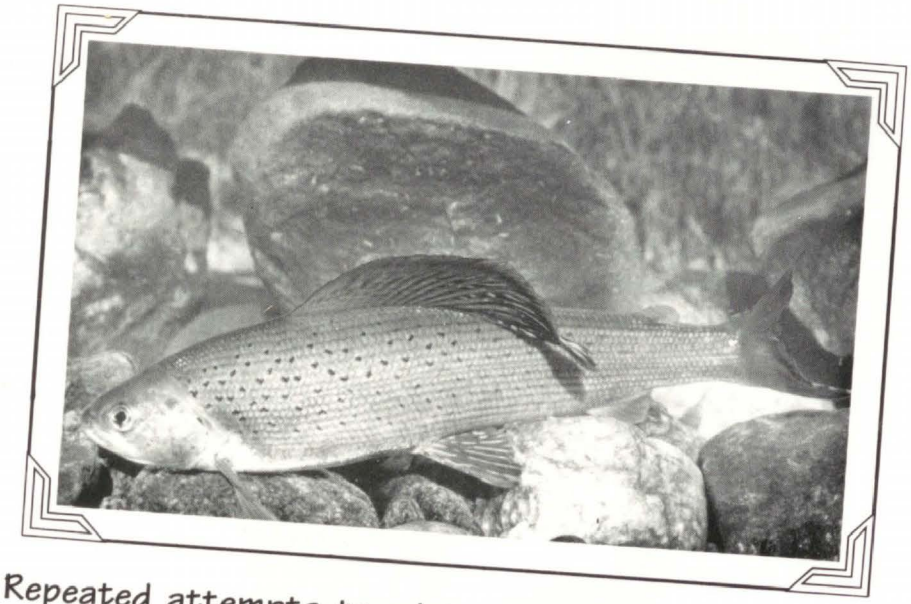
Biodiversity by System



Source: The Nature Conservancy

Additionally, 16 stresses that directly threaten key biodiversity elements of these systems were identified and evaluated for their potential impacts. Stresses impacting the basin include such factors as toxics, acidification, salinization, alteration of lake levels, sedimentation, and temperature changes. Those components having the greatest impacts seem to be

1945
1956
U.S. Fish & Wildlife Act
1958
Lampricide treatments begin in Lake Superior
1967
Salmon and Lake Trout stocking begins in an effort to control escalating Alewife and Smelt populations
April 22, 1970
First Earth Day
1973
U.S. Endangered Species Act
1986
North American Waterfowl Management Plan to restore and maintain waterfowl populations at 1970 levels
1994
Great Lakes Ecosystem Charter signed
1995



Repeated attempts to reintroduce the extirpated grayling to Michigan waters have been unsuccessful.

destruction of habitat, alteration of the physical processes within the system, and competition pressure from exotic species.

Human activity ranging from land development and water level management to mining and agriculture have adversely affected the basin ecosystem, but much has been done in the last two decades to mitigate those impacts. According to the report, "Although some lake communities have undergone major changes, and some species have been lost, the ecosystem as a whole still supports special biological resources."

In order to preserve the abundance and diversity of life in the Great Lakes basin, the report proposes four strategic activities:

1. Develop locally based projects that address significant systems and stresses;
2. Improve basic scientific understanding of biodiversity and its conservation;
3. Increase awareness of the basin's biological diversity and diversity conservation methods;
4. Increase support of both government and private institutions for the protection of biological diversity.

It is the intent of The Nature Conservancy that the report will inspire a series of large-scale, sustainable, locally driven protection initiatives throughout the basin, as well as programs for further education and research.

1943: Michigan legislature approves the purchase of the last large virgin hardwood forest in the Great Lakes states — to become Porcupine Mountain State Park.

Watershed Approaches:

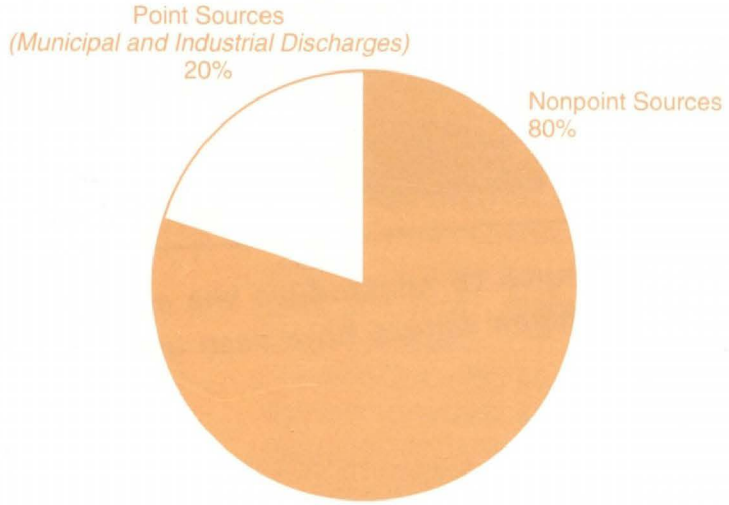
Nonpoint Sources of Pollution

Sources of pollution are generally classified as one of two types. One is point source pollution, which originates from a single identifiable source, such as a wastewater treatment plant. The other is nonpoint source pollution, which originates from diffuse sources in both urban and rural areas. Nonpoint source loads generally enter surface waters through atmospheric deposition or as runoff from land where contaminants are picked up by water and transported to rivers, lakes and, in some instances, directly to the Great Lakes. Nonpoint source pollution originates from a variety of land use activities including agricultural practices, livestock management, mining, construction activities, forestry practices, transportation, and a variety of urban industrial, commercial and residential activities.

Nonpoint source pollutants are usually dissolved in water or carried by sediment, often initiated by rainfall or snowmelt runoff. But the magnitude of the nonpoint problem varies among areas of the state and is strongly affected by such factors as land use practices, soil types and topography. The conversion of land from its natural state of mostly forest to more intensive uses, such as urban development and agriculture, typically makes the land more erodible, and is a major cause of nonpoint pollution. In urban areas, buildings, parking lots, and roads make much of the surface area impervious to water infiltration. Runoff from agricultural lands contributes additional sediment loads containing nutrients, organic compounds, pathogens and heavy metals directly to the receiving waters.

In 1986, the Great Lakes Phosphorus Task Force estimated that over 50 percent of the phosphorus entering both Lake Erie and Saginaw Bay was from nonpoint sources of pollution. According to the United States Environmental Protection Agency's (EPA's) 1992 National Water Quality Inventory Report to Congress, 72 percent of the states' pollution problems in assessed rivers can be attributed to agriculture, 11 percent to mining, and 11 percent to stormwater and urban runoff. This pattern of nonpoint source pollution in rivers and streams generally holds true for the Great Lakes and other coastal waters.

Phosphorus Entering Saginaw Bay
(1992 Michigan Department of Natural Resources Estimate)



Although billions of dollars have been spent to reduce the impact of point source pollution, many rivers and lakes are unable to meet water quality standards because of nonpoint source pollution. Therefore, to improve water quality to meet recreational, commercial and drinking water needs of the state, nonpoint sources of pollution must now be addressed.

Unlike point sources of pollution, nonpoint sources are not as amenable to conventional command-and-control regulations because they are numerous and diverse, with volumes determined by storm frequency, intensity, duration and seasonality. Moreover, there is social and political resistance to regulating and permitting farms, construction sites, timber operations, and similar contaminant sources.

Solving nonpoint source pollution problems in Michigan will require the implementation of abatement programs through the cooperation of federal, state and local interests. Coordinating efforts to reduce nonpoint source pollution must be a priority for all agencies, organizations and individuals involved, with a focus on voluntary and educational efforts. Governor John Engler is chair of the National Forum on Nonpoint Source Pollution, which is cosponsored by the National Geographic Society and The Conservation Fund. The National Forum's board is composed of prominent national leaders in the private, public, and nonprofit sectors, and aims to identify innovative nonregulatory (or nonmandated) means of reducing pollution from sources such as lawns, farms, construction sites, parking lots, and golf courses.

In keeping with its charter, the National Forum has established three working groups of experts to explore voluntary initiatives, education initiatives, and economic incentives. The forum should finalize a report and identify pilot projects by April, 1995.

Gilbert Grosvenor, president of the National Geographic Society, has promised to deploy the society's vast resources to educate the public on the threat of nonpoint source pollution to America's fresh water resources. In establishing incentives, the National Forum is exploring the feasibility of market-based approaches, such as trading between point sources and nonpoint sources, to encourage the use of least-cost alternatives to nonpoint source controls.

We must increasingly rely on partnerships between private citizens, local organizations, and government. These partnerships will allow us to pool resources and address those water quality problems of highest priority.

Five Leading Sources of Water Quality Impairment Nationwide

Rank	Rivers	Lakes
1	Agriculture	Agriculture
2	Municipal Point Sources	Urban Runoff/ Storm Sewers
3	Urban Runoff/ Storm Sewers	Hydrologic/ Habitat Modification
4	Resource Extraction	Municipal Point Sources
5	Industrial Point Sources	Onsite Wastewater Disposal

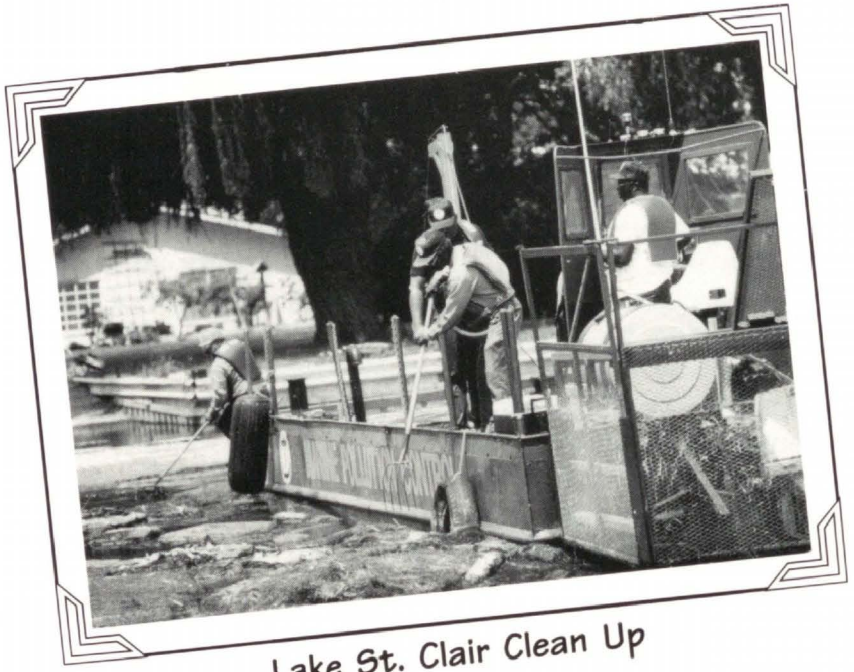
Source: U.S. EPA, National Water Quality Inventory Report to Congress, 1992

Nonpoint Pollution

Watershed Approaches:

Lake St. Clair 1994 Beach Closings

Although not considered a "Great Lake", Lake St. Clair is a part of the Great Lakes system and, as a smaller sibling, is often viewed as a microcosm of the other lakes within the basin. Dense population and industrial development have taken their toll on the air, land, and water quality of the lake and its tributaries. Combined with the introduction of exotic nuisance species, Lake St. Clair has exhibited symptoms of an ecosystem in distress. The approaches taken and solutions derived for the restoration and preservation of Lake St. Clair may hold the keys for the sustained vitality of it's international neighbors.



Lake St. Clair Clean Up

Lake St. Clair, located between the United States and Canada, is the smallest and shallowest lake in the Great Lakes system. It supports a large and diverse warm-water fishery and provides valuable habitat for migrating waterfowl.

In 1994, reports from citizens of excessive amounts of aquatic plants accumulating on the western shores of Lake St. Clair began reaching the Michigan Department of Natural Resources. This information coincided with reports of recreational beach closings in the area as a result of high fecal coliform bacteria levels. Many beaches had not been closed for 30 years prior to this event. In response to a request for declaration of emergency from Macomb County, a task force was assembled by the State Police Emergency Management Division with a mandate from Governor John Engler to treat this condition as if it were a "declared emergency."

1945

1955 U.S. and Canada establish Great Lakes Fisheries Commission

1956 U.S. Fish & Wildlife Act

April 22, 1970 First Earth Day

1972 Great Lakes Water Quality Agreement

1988 Zebra Mussels discovered in Lake St. Clair

1990 Gobies discovered in Lake St. Clair

1995

The massive accumulation of aquatic plant material in Lake St. Clair resulted from dramatic changes in the ecology of the Lake in recent years. This was coupled with abundant early growing season sunshine followed by substantial storm events and accompanying winds from the east and south, which drove the detached plant material to shore. The changes in the lake have been observed by scientists on both sides of the international border and are largely attributed to increased water clarity, resulting from the arrival of zebra mussels in 1986. This has caused a historically turbid lake to become clear as the zebra mussels filter out particles from the lake water. Light penetration to greater depth in the lake is causing an increase in aquatic plant growth. Rooted aquatic plants, once absent from the open lake, are now taking hold. Plants which previously grew in water three to four feet deep are now growing abundantly in water 18 feet or more deep. The plants are part of the changing lake ecosystem.

The economic, human health and water quality implications of the closings are significant. The beaches on the northwest shore of Lake St. Clair in Macomb County are some of the most popular recreational beaches in Michigan.

The data collected by local and state agencies suggest that a combination of factors caused the extended beach closings. The Michigan Environmental Science Board, after reviewing all available data and information made the following conclusions as to the causes:

- The large number of high intensity, long duration rains in 1994 caused an unusual amount of runoff. The runoff flushed wastes from animals and humans into the watershed. The human wastes were from faulty septic tank tile field systems and improper connections of sanitary sewers to storm sewers.
- The rains overwhelmed the sanitary sewer systems in the watershed causing a number of discharges from the five combined sewer retention basins in the area. During the period May through July, about 1 billion gallons of combined sewage entered the lake.
- Strong onshore winds pushed the bacteria into the beach areas, requiring their closing. The winds also pushed a large weed mass into the area, trapping the bacteria near shore.

Ironically, there has been significant improvement in the water quality of Lake St. Clair in recent years, in part due to improved sewage conveyance and treatment systems. In the last 10 years, 14 local communities have significantly improved their wastewater collection and treatment facilities. The beach closings, however, highlighted the need for additional nonpoint source control and for the evaluation and further upgrade of sewage transport and treatment systems in the area.

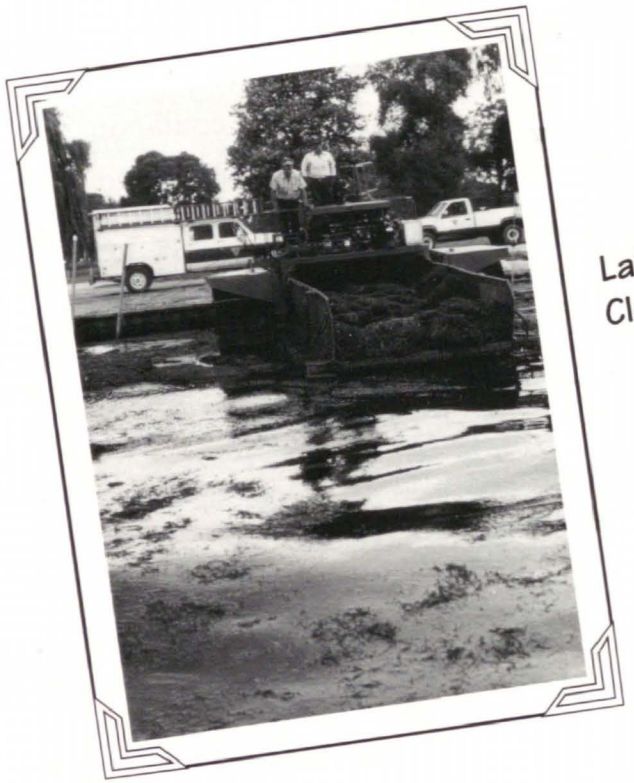
Officials from both Michigan and Ontario are committed to meeting on a regular basis to accomplish the following goals with respect to Lake St. Clair:

- Sharing technology to combat bacterial contamination of the lake;
- Educating both populations on how to deal with the changing nature of the lake;
- Petitioning both national governments to help regulate the influx of such exotic organisms as zebra mussels;
- Area wide implementation of stormwater best management practices;
- Improved oversight of soil erosion regulations by local enforcing agencies;

Zebra Mussel

- Evaluation and control of septic tanks and tile fields by local health departments;
- Programs to identify and eliminate cross connections of sanitary and storm sewers;
- Elimination of discharges of raw and untreated combined sewage through the separation of sewers, and the construction of retention and treatment facilities by affected communities;
- Regional planning for future growth and the associated pollution control infrastructures;
- Support of, and participation in, the St. Clair River and Clinton River Remedial Action Plans to ensure a unified and continuing effort in the improvement of the resource.

Goby



Lake St. Clair Clean Up

"The residents and boaters will have to adjust to the new greener Lake St. Clair. The plants will continue to increase in density resulting in regular seasonal nuisance problems, especially in spring and fall. Large masses of plant debris could arrive on the beaches after severe windy weather events which can occur at any time of the year. The plant debris will naturally decompose and disappear in days or weeks, depending on weather conditions. Clean up of plant debris is similar to raking of leaves in the fall. They can be used for compost, or dried and landfill site disposed. Spectacular concentrations may occur after major storms requiring an organized community approach for disposal options. The plants are a natural phenomenon and, like leaves, have no regard for private property boundaries."

Ontario Ministry of Environment and Energy; May, 1994.

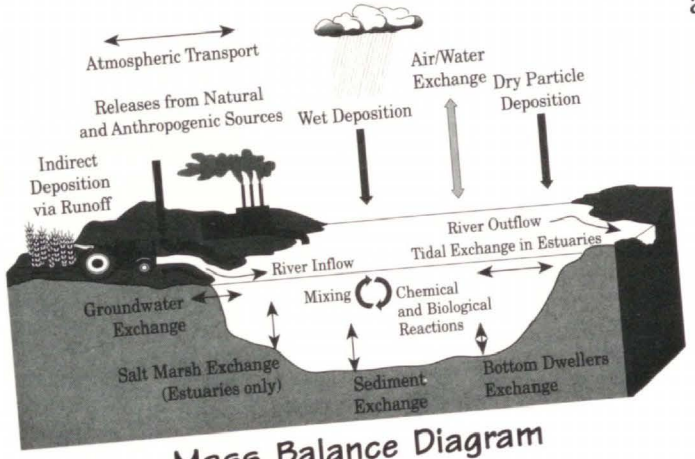
Lake Michigan Mass Balance Study

A mass balance study of Lake Michigan under the direction of U.S. Environmental Protection Agency's (EPA's) Great Lakes National Program Office (GLNPO) is now underway, involving personnel from the Michigan and Wisconsin Departments of Natural Resources, state agencies in Illinois and Indiana, and federal agencies including several parts of EPA.

Mass balance is based on the law of conservation of mass; balancing the amount of a pollutant entering a lake (the load) with the amount leaving, trapped in the lake, or changed chemically. While the concept of measuring what enters from the air and rivers is simple, the processes that move the pollutant through the lake ecosystem and change the pollutant are complex.

The study is designed to answer questions that will help environmental managers make well-informed decisions on reducing toxic pollutants in the lake. By monitoring loads from rivers and the air, GLNPO and the other agencies with whom it is working, will determine the importance of each of those sources to the total amount of a pollutant entering the lake.

Information that is gathered will be used in a mathematical model of the Lake Michigan ecosystem. This model will allow scientists and environmental managers to determine what effects the reduction in pollutant load will have on the lake, and in particular, on contaminant levels of top predator fish tissues.



Mass Balance Diagram

The study has many parts. Samples will be taken from rivers during snow melt and heavy rains, when most pollutants are washed into the lake. Pollutants from the air will be measured from ships and at land-based sampling sites that collect rain and deposition of the particles in the air that wind up in the lake. EPA's research ship, the *Lake Guardian* and National Biological Survey fish trawlers will also take samples to determine concentrations of pollutants in the lake water and in plants and animals in the lake.

Other studies will be conducted to determine what large urban areas contribute to the lake through the air, the transport of pollutants within the lake and their movement and concentration through the food chain.

Lake sediment will be sampled extensively to determine the total amount of pollutants in the mud that could be cycled back into the lake. Smaller studies will be conducted that will provide remote sensing (satellite images) information to determine where pollutants go and the effects of lake ecology on the concentration of contaminants in fish.

The mass balance program and workplan are part of a larger monitoring program for Lake Michigan designed to address reduction in the release of toxic substances to the Great Lakes system. These activities are part of the Lakewide Management Plan (LaMP) for the lake that was mandated under the Clean Water Act, the Great Lakes Water Quality Agreement, and the Clean Air Act Amendments.

Watershed Approaches:

Lake Erie Lakewide Management Plan

In the 1960s, Lake Erie was pronounced "dead". The waters were fouled with sewage and toxic wastes. The fishery was non-existent. Through concerted efforts on the parts of both the United States and Canada, the lake is being restored to a vital water resource. One such ongoing restoration effort is the Lakewide Management Plan.

In the spring of 1993, the United States' Environmental Protection Agency and Environment Canada began the initial phases of planning for the development of the Lake Erie Lakewide Management Plan (LaMP) in accordance with the Great Lakes Water Quality Agreement (GLWQA). Other participants included the states of Ohio, Michigan, Pennsylvania, and New York.

The goal of the Lake Erie LaMP is the restoration and protection of the beneficial uses of Lake Erie. The LaMP will fulfill the obligation of the GLWQA to address critical pollutants, including toxic pollutants. It has been recognized that the integrity of the Lake Erie ecosystem may not be fully protected or restored until other factors (such as habitat loss and exotic species) are also addressed. The LaMP process is an opportunity to address these other factors in a coordinated manner. Therefore, the LaMP will use an ecosystem approach, integrating environmental protection and natural resource management. This approach will require all participating agencies and jurisdictions to work together, utilizing their respective authorities and responsibilities.

- In defining the scope of the LaMP's approach, the term "environmental stressors" is used to cover all influences that impact the beneficial uses of the Lake Erie ecosystem. Environmental stressors are those factors which cause or have the potential to cause impairment of any of the beneficial uses of Lake Erie. These factors include chemical, physical or biological influences on the Lake Erie ecosystem, as well as management practices and evaluation of critical pollutants. It is currently accepted that loss of habitat and the invasion of exotic species are very important internal stressors to the Lake Erie ecosystem, but additional stressors may also be located beyond the waters and shoreline to the land areas and tributaries of the Lake Erie drainage basin, the connecting channels, and even beyond the Great Lakes Basin.
- Lake Erie LaMP activities will be closely coordinated with other related initiatives, such as Remedial Action Plans for Areas of Concern within the Lake Erie drainage basin. Lake Erie LaMP activities will also be coordinated with programs downstream of Lake Erie that are influenced by Lake Erie waters, like the Niagara River Toxic Management Plan and the Lake Ontario LaMP.
- Public involvement in the LaMP process will occur through a variety of coordinated programs designed to foster effective two-way communication with the diverse population of the Lake Erie basin, as well as with interested members of the public outside the basin. Ultimately, the LaMP will only be successful when it brings all relevant jurisdictions and agencies together to effectively implement actions that result in the protection and restoration of the Lake Erie ecosystem.

Watershed Approaches:

New Hope for the Saginaw Bay Watershed

The Saginaw Bay National Watershed Initiative has accomplished significant progress toward the protection and restoration of the Saginaw Bay Watershed. Through the combined efforts of more than 200 federal, state and local government agencies, non-profit organizations and businesses, and some 50,000 watershed residents, the Initiative effort has successfully formed partnerships to maximize use of area resources to address the environmental challenges facing the Saginaw Bay Watershed. During the past three years, these activities have involved landowners, farmers, teachers, students, government officials and youth group members. The key to the success of this Initiative has been the ability of all the various agencies and individuals involved to work together.

The Saginaw River and Saginaw Bay have been jointly designated as one of Michigan's 14 areas of concern. A remedial action plan, identifying the actions underway and actions needed, has recently been completed by the Michigan Department of Natural Resources. Projects such as review of land use and zoning plans, wetland restoration, river cleanup programs, soil erosion and sedimentation control, nutrient management, watershed education, school river monitoring and others are highlights of the watershed actions to date. These programs will need continued community support to strengthen and further the progress already made.

1890: Peak of the timber harvest in Michigan — 4,250,000,000 board feet.

The Initiative has made significant progress in the control of nonpoint source pollution through a variety of efforts. Funding has assisted over 4,000 farmers in the 22-county watershed to implement best management practices

on some 100,000 acres, greatly reducing pollutant loadings to the Bay and the watershed. Educational programs are helping farmers incorporate agricultural production practices that reduce erosion without reducing farm income. New soil erosion training materials are being used to train over 100 agencies in the watershed on current soil erosion technologies.

After three years of effort, the most persistent need is that of continued local involvement in the on-going cleanup and protection programs. By doing this, area residents can improve their understanding of what they, as individuals living in and using the watershed, can do to help restore and protect the waters. This can only be accomplished through a strong partnership between local citizens and government. Two important local groups have stepped up to take on the challenge; the Saginaw Bay Watershed Council, representing local government, and the Saginaw Basin Alliance, representing local citizens. To be successful, these local associations need our support.

While funding provided by the Environmental Protection Agency has supported numerous activities to date, continued federal financial support for the Initiative is unlikely. Initiative partners are pursuing other funding sources to meet the long-term goals of enhancing and protecting the Saginaw Bay Watershed. Continued cooperation is essential if the benefits of an environmentally-sound Saginaw Bay Watershed are to be realized for current and future generations.

INITIATIVE PROGRESS TO DATE

Soil Saved	**287,000 tons**
Phosphorus Saved	**293 tons**
Nitrogen Saved	**236 tons**
Conservation Tillage	**45,100 acres**
Fertilizer Management	**36,400 acres**
Stream Filter Strips	**347 acres**
Livestock Exclusion from Streams	**23,900 feet**
Integrated Crop Management	**9,800 acres**

1869: Purple Loosestrife introduced into the Great Lakes Basin

Chicago Water Diversion

Chicago, like many metropolitan areas in the Great Lakes Basin, uses water from Lake Michigan for its public water supply. As the city grew, so did its wastewater and storm runoff, which were discharged back into the lake. In the 19th century, the city experienced two significant public health catastrophes when several thousand people were afflicted with typhoid fever and cholera as a result of drinking contaminated water. Since then, Illinois has gone to considerable effort to ensure that all wastewater and stormwater is diverted away from Lake Michigan. It enters the Sanitary and Ship Canal, completed in 1900, linking lower Lake Michigan to the Mississippi River Basin via the Des Plaines River.

Epidemics of cholera in 1854 and typhoid in 1891 were attributed to sewage contamination of Chicago drinking water.

The volume of Lake Michigan water diverted has varied substantially over the years, and several of the Great Lakes States, including Michigan, went to court to limit the diversion. The U.S. Supreme Court established a limit of 3,200 cubic feet per second, to be achieved as an average over a 40-year measuring period starting in 1981. In 1994, Michigan received notice that Illinois has been diverting about 15% more than the allowable flow. Illinois asserts that it has not increased the volume of water it diverts, but that improved measurement techniques have created a discrepancy with previous years' measurements.

In addition to changes in measurement techniques, Illinois is also concerned that the navigational locks, maintained and operated by the U.S. Army Corps of Engineers (ACoE), leak an excessive amount of lake water into the river and canal system. The ACoE is not bound by the Supreme Court decree, and provides passage to any commercial or recreational vessel on demand. Although Illinois has virtually no control over this water, it is included in the accounting of diverted flows. The harbor walls and gate structures are not water tight, and significant additional water passes into the Sanitary and Ship Canal; water which provides no navigational, water supply or other use. Illinois has been unsuccessful in its attempts to have the ACoE separately report the volumes used as lockage and leakage, and has recently engaged the U.S. Geological Survey (USGS) to estimate the leakage.

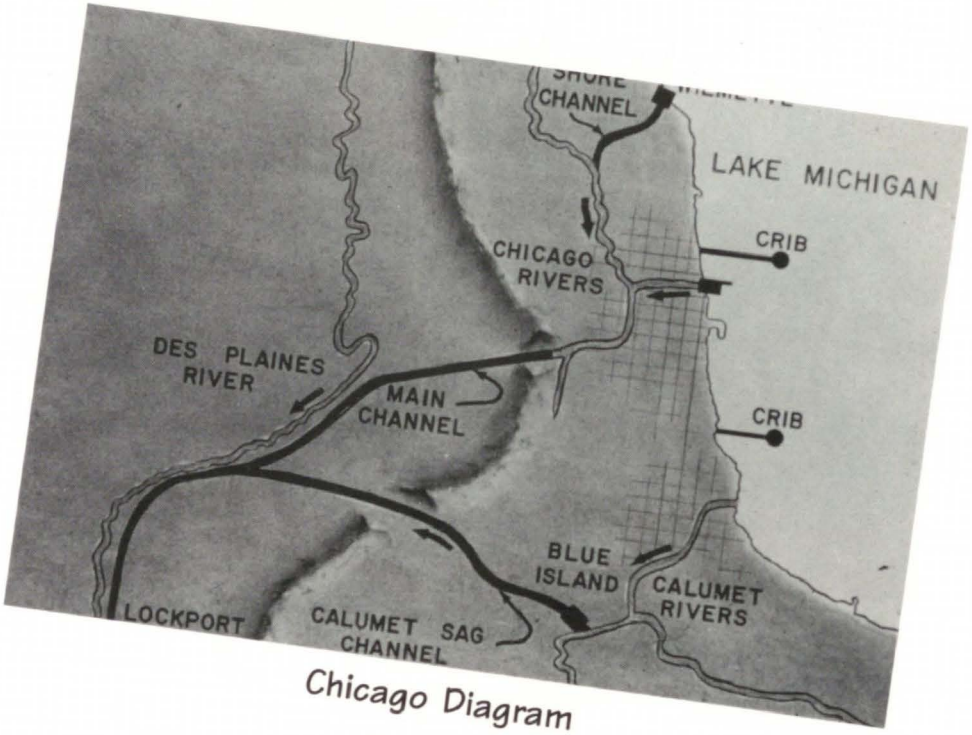
Officials from both states met with representatives from the ACoE and the USGS to discuss Illinois' water allocation program, flow measurement techniques, and potential alternatives to reduce the volume of diverted flows. Although improvements in wastewater treatment and

stormwater management in the metropolitan area have improved water quality, the volume diverted for this purpose, called discretionary flows, has not been reduced.

Illinois officials have indicated their interest in seeking Congressional authority for the larger diversion, however Michigan will continue to seek and pursue methods to limit the diversion to the flows previously sanctioned by the Supreme Court.

Leaking Locks

Chicago Map



Chicago Diagram

Acknowledgements

Writers

Department of Natural Resources

Jim Bredin, Office of the Great Lakes
Mark Coscarelli, Office of the Great Lakes
Dr. Elwin Evans, Office of the Great Lakes
JoAnne Foy, Air Quality Division
Sharon Hanshue, Office of the Great Lakes
J. Mark Hargitt, Surface Water Quality Division
G. Tracy Mehan, III, Office of the Great Lakes
Anita Singh, Office of the Great Lakes
William Stone, Surface Water Quality Division
Joy Taylor, Air Quality Division

Guest Contributors

Thomas L. Baldini, International Joint Commission
Congressman John D. Dingell, U.S. House of Representatives
Gordon K. Durnil, International Joint Commission
Dr. Lawrence J. Fischer, Michigan State University
Brett Hulsey, Sierra Club
Patrick E. Lindemann, Ingham County Drain Commissioner
F. Patrick Nixon, Ford Motor Company
George J. Ryan, Lake Carriers' Association
Andrew J. Such, Michigan Chemical Council
Tom Washington, Michigan United Conservation Clubs

Publications

Martha Waszak, Office of the Great Lakes (Editor)
Linda Humphreys, Office of the Great Lakes

Cover and Graphics

Stephen Bolt, Reproduction Services, Department of Management and Budget

Layout and Typesetting

Ann Hartley, Reproduction Services, Department of Management and Budget

Photographs

Dave Kenyon, DNR, Press Office
Dave Jude, Great Lakes Sea Grant Network
Carol Allaire, Great Lakes Sea Grant Network
Judy Wheeler, DNR, Parks & Recreation Division
State Archives of Michigan

Annual Report for 1994

Prepared by the Office of the Great Lakes —
Michigan, Department of Natural Resources

Pursuant to Public Act 128 of 1985 for Governor John Engler

Total Number of Copies Printed: 7,500
Total Cost: $8,500 Cost Per Copy: $1.13

PRINTED ON
RECYCLED PAPER

Office of the Great Lakes